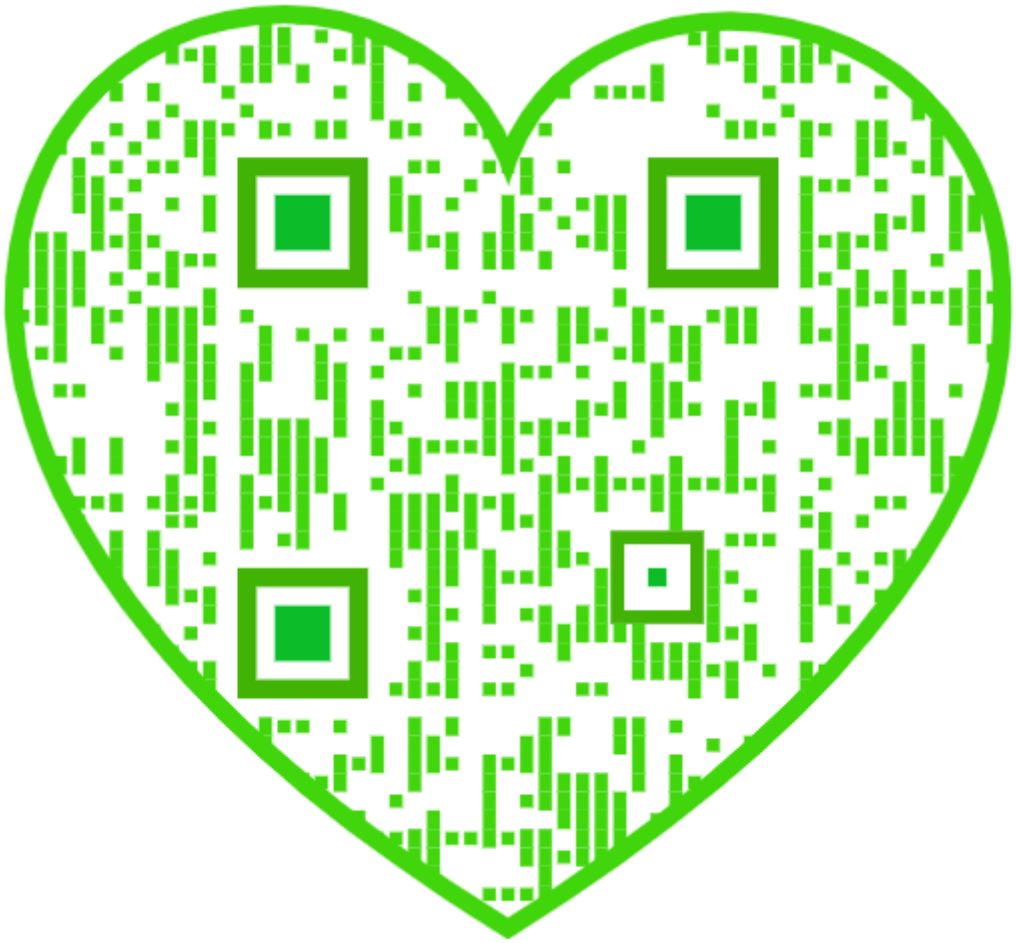

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THE OPERATING ROOM

A PRIMER FOR PUPIL NURSES

BY

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TO

MINE OWN PEOPLE

FOREWORD

This little book has been slowly and anxiously pieced together not by one continuous task, but by culling an idea here, a formula there, a test somewhere else, from the conversations of numerous good friends in the medical and nursing professions, and from happy memories of days in training under the kindly, thorough instruction of Miss A. M. Rykert and Miss J. MacCallum (now Mrs. Schenck, of Detroit), for the opportunity to be under whom those who were so fortunate have been increasingly proud and grateful as time goes by. Yet, withal, this book will seem rather crude in comparison with the finished work of experienced authors. Generously excuse its faults on the ground that it is only a pioneer, *from a nurse to nurses*, and not from a physician to nurses! These data have been garnered from journals on nursing, from physicians' libraries, and from the practical experiences of friends. If its humble appearance proves to be an inspiration to others more skilled, to take up the labor and go farther, it will have accomplished much. If, again, any nurse chances to learn that she too can constantly acquire information that may be at any time, no matter how remote, tremendously useful to her, it will not have been written in vain.

My sincere thanks are due to Dr. T. Mitchell Prudden and Dr. W. M. Brickner for permission to quote from their valuable works, to Dr. C. A. Smith and Dr. C. H. Fulton for their constant personal assistance, to Dr. E. M. Smith and Dr. A. Beck for contributions on their special lines of work, to Mr. F. H. Kollman for useful pharmaceutic data, and to the firms Kny-Scheerer Corporation,

Foregger Co., Inc., Lentz & Sons, for the loan of numerous electrotypes, and to J. F. Newman, manufacturing jeweller, for the design on the title-page.

Most especially, however, this work has been forwarded and is largely due to the encouragement and careful revision given by Miss B. I. Brazeau, R. N., and Miss I. M. Hall, R. N., two operating-room nurses, whose absolute conscientiousness, skill, and willing spirit, enhanced by many tenderer graces that make the perfect woman, deserve a far higher tribute than can here be given.

"The Trained Nurse and Hospital Review" kindly gave permission to use the original articles which were expanded for some of these chapters.

AMY ARMOUR SMITH.

NEW ROCHELLE, N. Y.
September, 1916.

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OPERATING ROOM

CHAPTER I

OPERATING-ROOM PUPILS

"A task!—To be honest, to be kind; . . . to renounce when that shall be necessary and not be embittered; to keep a few friends, and these without capitulation; above all, on the same grim condition, to keep friends with himself; here is a task for all that man has of fortitude and delicacy."—*Robert Louis Stevenson.*

Rotation of Service.—The superintendent or directress of nurses must keep the operating-room supervisor thoroughly posted about the pupils' rotation of service, so that a new pupil's arrival in that department does not interfere with the smoothness of its workings. Then, too, illness and vacations being taken into consideration, there must always be available one nurse at least in small hospitals, more in the larger, who is free to go back to that service when needed. There is a tension and importance about this "core of the house" that enforces a sort of militarism, or establishment of a standing army of nurses who "have had operating room." There is a very pleasurable excitement in the arrival of one nurse and the departure of another, a large amount of speculation about where the latter will go, and how the former will fit in, that varies the monotony of the daily round. It has often been demonstrated that out of very unpromising material a good operating-room nurse can be made, because of her sudden flaming-up of enthusiasm for a new kind of work in this tense atmosphere. We call it the "core" of the house because it contains all the

seeds of the future success of the institutions which undertake work that cannot be with equal facility and success conducted at home, and which are to be supervised by some of these same pupils in the future.

The First Day.—By a careful planning, calculating on the help in any emergency of the pupils who have finished the service, so as to be perfectly free to teach, in a period void of excitement or demands on her attention, the supervisor greets her novice in the early morning of the first day and begins at once to devote a certain number of hours to instructing her in the primary duties she will have to perform. It is impossible to devise arrangements to suit the operating-room *personnel* of all hospitals that undertake surgery, whether general, special, private, charitable only, or emergency, and besides, in a very large city where all these kinds exist side by side, conditions are so dominant as to force their work into certain grooves. It is rather toward the small hospitals in the suburban counties that these chapters are directed, since they toss hither and thither on the reefs of crystallized whims of a few men who by their early pugnacity, doubtful politics, or genuine philanthropy became the pillars of the staff and brought to its beds patients of such substantial means that the Board of Directors brings a pressure to bear on all resident officials to humor their notions somewhat. A generous, open-handed community, an upright body of governors, and an ethical Medical Board are the things to be desired for the hospital's backing, and it is in the hope that these are the goal of each man's ambition that the suggestions herein contained have been evolved.

The Little Hospital.—Many little operating rooms have been successfully conducted by one graduate nurse who at times performed other duties in the hospital as well, simply calling one pupil from the wards during the period when the patient is under the anesthetic. Some have one steady pupil and one on call, others two steady pupils, and so on, up to the large institutions which con-

duct several operating rooms *en suite* at once, with the large staff of pupils working interchangeably to their mutual advantage. Let not the little hospital force be discouraged, however, because its gains are "writ large" in accuracy, thoroughness, and personal interest in surgeon and patient, besides a breadth sometimes that is derived from acquaintance with the methods of maybe as many as twenty-five of the picked surgeons from a near-by metropolis, who are pleased to come out to operate on the wealthy residents and find faithful, unerring service.

The little operating room was the first to subscribe to the wish now almost universally voiced, to standardize operating-room technic. The operating-room supervisor, as well as all officials above her, should be a member of the American Hospital Association, and become identified with the sessions of the surgical department. The Board of Directors should pay her or their expenses to these conferences, and demand a good report, and progress in the service of the hospital later. It is also incumbent upon us to promote more frequent conferences among these supervisors within our own counties. They are very important people. The occupations of the inhabitants, inclement climate, facilities for transportation all determine largely not only the hours at which operations are held, but the nature of the cases to be done. When they meet they should not brag about how they do things, but should ventilate all their difficulties and say, "How do *you* do this thing? How do *you* manage when that event happens? What percentage of skin infections do *you* get?" This requires the hearty coöperation of the senior officers in the hospital to arrange for substitutes and traveling expenses.

The large institutions of the nearby cities should be visited to see modern equipment, new methods, and often to derive, maybe, a great deal of consolation for feeling that in some respects they are not so up to date as the visitor's. But this moving about keeps one alert and vigilant, and many good hints are picked up.

Few of the professional journals accord to the operating room a special section, and yet, to the man on the street, to the nurse, and to the majority of the general practitioners who send cases in to a hospital, the operating room is "the whole thing."

On the first day of a pupil's term here the head nurse takes her through what has been hitherto forbidden ground, all the rooms belonging to the department, so that she may understand the "lay of the land," to find other persons quickly. She is introduced to all her fellow-workers in their respective capacities, scrubbed nurse, anesthetic nurse, so that the former, who is very much preoccupied, need not be disturbed for what the latter could just as well tell her. The successful supervisor gives her instructions in a clear, low, emphatic tone that reaches only the one it is intended for, and not too fast, at that. Frowns, signs, beckoning, or whispers are all very puzzling to novices, especially because they come up filled with terror, and are quite stage-struck and self-conscious at first.

The Surgeon's Duty to the New Pupil.— To this novice *every surgeon* or anesthetist has an *obligation*, for she may some day be the brightest star in his firmament. Instead of ignoring and snubbing her, he should help her in every way within his power. The surgeon is so dependent on others for help that he ought to be sensible about building for the future. There will be times that a new pupil has to appear in the main room, that is, the most important of all the suite, but a clever supervisor will plan, as far as any human being can, to grade her work so that the novice is never confronted with any condition that she cannot completely master. To arrange so that the first thing a new pupil is seen doing she does well gives not only her but the surgeon confidence. But he should be big enough of soul to accept his share of the burden of training the pupils of the school, and to forget whether they are bright eyed or young, but to teach them, impersonally, calmly, and definitely. They will remember every word

he says, and it is much more profitable to say, "I always use ten-day chromic for the perineum," than to throw on the floor what she tremblingly hands him. Nothing depleted the ranks of the nursing force (*i. e.*, in proportion to the increase in the number of hospitals and beds everywhere) like the oaths and throwing instruments about in the old-fashioned operating rooms.

A new pupil should never be sent to look for an instrument in a moment of panic if she has never heard of it and has no mental image of it. When you lose your thimble, you will never find it if you think about pears. You must think "thimble." In these panics the instrument is not described graphically, the pupil fails to find it, and time is lost. *Be ahead of the game.* All those things must be laid out beforehand, in even the remotest possibility of being used, though they need not be boiled. They can then be easily pointed out. One of the most meritorious qualities developed in a careful operating-room training is forethought. It is far better to lay out too many dressings, or to open and thus unsterilize some special form of dressing, than to rush frantically for some in the middle of a critical operation. The surgeon has to bear all the responsibility of the case and its results, whether fatal or happy, before the visiting physician who sent it in, the relatives, the hospital authorities, and public opinion. It is criminal to leave him without good, reliable support in caring for the patient. The fact that some surgeon may be *persona non grata* is no excuse for sending him an incompetent pupil as assistant. If all questions are answered on the basis, "What is best for the patient?" or "How can we do the greatest possible good to the greatest possible number?" there will be absolutely no unfairness to any person connected with the institution, whether it be a surgeon whose ways are not modern, or a pupil nurse who uses too many ward dressings.

Do not forget what the hospital is conducted to accomplish—to cure the sick and to rid the community of

disease, unjust expense, and unhappiness. It does not *exist for the purpose* of training good operating-room nurses. That occurs if it does the other duty well.

The Telephone.—There will doubtless be free telephone communication with the operating-room department on account of the interns' relation to the wards, the presence of visiting doctors, and the calls of the surgeon's private practice. These calls must be very clearly taken; since it means money to the surgeon, and allaying the anxiety of the family at the other end of the wire, anxiously waiting. The supervisor, therefore, should keep a printed list of the names of the men who operate or view cases, and teach the new pupil the pronunciation of any difficult foreign names, so that she, being the superfluous nurse, may master them and take care of the telephone. There is one salient feature in all the training of pupil nurses, whether in a big metropolitan institution or some tiny suburban cottage hospital. They must roam about and learn the names of all highways and byways, so as to be familiar with the vicinity in which they work, on account of calls for doctors, the addresses of patients, and speed in sending out the ambulance—in brief, the development of a strong business acumen. It should be the duty of this same nurse to keep pad and pointed pencil for instant use at the telephone, this extension being so important that it should be of the desk variety, fixed on a table or desk, and not on a wall.

Some Ways of Arranging Work.—The most modern hospital methods include in the first few months' tuition of probationers, before they ever set foot on the wards, the making of all hospital dressings, for clinic, ward, or operating room, in which case they become very familiar with the names of all forms of gauze and cotton, *i. e.*, wipes, compresses, fluffs, sponges, tampons, etc. This relieves the much busier, advanced pupil who is getting her operating-room training of a great deal of monotonous mechanical work, requiring no real professional skill and acting only as a sedative for a probationer's excited

nerves. "Let George do it" is a good motto in many respects for hospitals to apply to their internal economy. There must be developed accuracy, skill, honesty, unselfishness along every line, but it is the rankest extravagance to make a second-year pupil sit folding gauze all morning and work then until midnight in the operating room, when dressings can be made by a probationer, a clean patient, or an orderly. It is quite usual for private patients, their special nurses, and their relatives to ask for some such thing to do. To ask a nurse to do what anyone less skilled can do just as well, after she knows how to do it well and quickly, wastes efficiency. The supply room should be separate from the rest of the hospital, though governed by the operating room, so as to regulate the amount of supplies as estimated from the operating-room records, where clean wounds, discharging wounds, and goods sold to physicians are all entered.

Importance of Dusting.—But the principle of using unskilled labor where possible does not apply to dusting, or several other things that some nurses would like to evade. Dusting in a hospital is a scientific process that must be performed by one on whom the hospital can place responsibility for the success of its work. Orderlies or maids have no connection whatever with the results in a wound further than their own healthy condition, but nurses are to be held accountable for all those features, such as air, light, heat, and dust, that rank as accessories to the main act. For the simple reason that orderlies and maids receive no diploma, may leave at a second's notice, and have no comprehension of the meaning of bacteria, dusting must not be left to them, but be performed by a responsible person. Nurses are members of a class in society who, presumably, take pride in their work, who work because they know that labor is necessary to keep well and sane, who do things well because they are proud to excel, and who want to satisfy a growing desire within themselves to attain more knowledge, more deftness, and more approval. The pupil who covers

a great deal of ground and takes long strides and strokes, occasionally letting things fall and break, is a menace, though her pyrotechnic displays may impress an onlooker whose judgment is shallow. But a pupil whose work behind the scenes is honest and enduring, who knows that the water in the sterilizers has boiled long enough, or that she positively has scrubbed every inch of the marble pit with Sapolio and Labarraque's solution, who remembers and attends to every detail of pin, pledget, or packing with meticulous care, is the foundation of success in surgery. It is peculiar and unfortunate that the opinions of doctors and supervisors seldom coincide about who is a good nurse. There is a sort of superficial smartness and precocity which take very well with surgeons during their hour of tense strain, existing probably because the pupil is rested physically, and has not fatigued herself by doing her whole share behind the scenes, or because she has naturally more self-possession, or more readily places herself in an impressionable attitude of mind to receive a telepathic intimation of the surgeon's wish. It is very rare, but does occur, that a nurse does her share of the rough work honestly and at the same time shows great skill and coolness with instruments. But passing instruments for a surgeon has nothing to do with teaching other nurses, or humoring the relatives of a private patient, or paying one's dressmaker and yet saving money for one's old age. The ethical supervisor cannot decry the showy, dishonest pupil to the approving surgeons, but she must insist on thoroughness and completion of all that pupil's share—no putting off until tomorrow what should be done today. The operating room must be completely ready in every respect at the end of each day.

Some Difficulties which the Supervisor Has to Solve.—It makes a just supervisor's life very difficult to be at close range with a pupil whose tricky deceits make her feel uneasy about results, such as opening the autoclave too soon, or making up a hypodermic dose inaccurately,

knowing all the while that this pupil is getting credit for cleverness from people who are easily fooled by show. Frank talk and constant checking up, combined with a nice judgment of human nature, a generous allowance for youthful vanity, and quick approbation for attempts to improve may help correct these obnoxious conditions. Otherwise they become a festering sore in the heart of the remaining pupils.

There is a special gift in handing a surgeon what he wants without having to be told, but it is governed by certain important factors. One must first know every inch of the operating-room suite. This is gained by daily dusting, putting supplies away, and taking inventory. Second, one must have in mind an accurate, anatomic picture of the operation to be performed. This must be taught before each kind of case to the pupils who will take part. Then, third, one must have all the goods required generously supplied in a systematic way on the sterile tables. Fourth, the workings of every screw, lever, and button on instruments, cautery, or lights must be thoroughly known beforehand, learned in quiet lesson hours and practised to get speed, without an audience. To control the welfare of pupils or patients by these methods gives the shy nurse an equal chance, and elevates the operating-room supervisor's position to a lofty degree.

Sequence of Instruction.—After the pupil has been introduced to every hole and corner in her new scene of labor, she should be quizzed to find whether she took in what she saw, so as to form the habit of observation:

(1) What rooms adjoin the operating room?
(2) Where is the oxygen kept?
(3) Where is the normal saline?
(4) Who is anesthetic nurse?
(5) Which is the hot-water sterilizer?
(6) How many stands are in the scrub-up room?

In making these rounds the head nurse should frankly point out existing difficulties—to watch for the backward swing of a certain door, to keep screens in all windows,

to swat flies, to keep steam out of the main room or to reduce noise—always showing what would be an ideal condition to foster in these minds the ideas that will result in finer construction and equipment in future hospitals. Couple work with hopeful imagination.

Routine Cleaning.—In teaching the pupil to dust the method should coincide reasonably with that employed in the wards—soap and water and two dusters, with Bon Ami smeared on glass to dry. The supervisor demonstrates the direction of movement, beginning in corners and coming to the center; the system of going around a table or chair rung after rung in orderly rotation, not hither and yon, so that, if called away, one knows where to start again, since in this department everything must be *covered completely*, not just the seemingly dirty spots.

Dusters of various kinds are needed, stout, soft-made cheese-cloth dusters for rubbing soap or Bon Ami on, brushes for Sapolio, and thick, dry, *lintless* cotton cloths for drying and polishing. In the hopper room are kept all articles for damp work; therefore this room must be well sunned and aired. Each nurse should dust her own section of the operating-room suite, so that it is all finished early. The new nurse is not a drudge or a Cinderella. If she spends all morning cleaning while nobody else does any, the place is not in order on time, and she is not learning any the ways in which she should become instantly useful, a fleet-footed messenger. Mops, brooms, and brushes belonging to each worker are kept separate, so as to be easily checked up or found. It is wrong to ask an orderly to do any scrubbing higher than the floor or lower than the chandelier. In any case, he should be well supervised.

In whatever section the pupil nurse is placed, whether new (and "dirty"), anesthetic, or scrubbed, she should constantly observe what the one next highest has to do. The average hospital has three pupils on this service for from six weeks to three months each, giving them from one-half to a whole month in each of these sections above

named. Three or four days are enough to become subconsciously familiar with routine duties, so as to cast a free eye on the work of one's immediate senior, because emergencies of every kind will be conducted well by this acquisition of knowledge.

Utensils and Linen.—The next lesson is in the care of utensils, but not of instruments delicate in construction and difficult to obtain. It is wrong to place the instruments in the hands of a greenhorn. She who passes instruments, knowing which and how many she has laid out, must put them away, with help, of course, to break in her juniors who usually get through before her, but so that she may carry the responsibility of their count and condition—especially keeping them in a fixed place on the shelves that everybody will know, and in an order that has some anatomic science at its basis. But the new nurse may scrub basins, baskets, tubs and faucets, and sort linen for the laundry, washing off all clots before it goes down the chute. By coöperation with the laundry a strict check can be kept as to who let an instrument go down the chute, a small pillow, or a rubber sheet, particularly when, as a disciplinary measure, the lost articles are returned via (1) the superintendent's office, and (2) the superintendent of nurses' desk. At many more times in the day than from the other chutes the laundry clears away the linen from the operating-room chute, which should be situated separately from the others where they debouch on the lower floor, and by the hours when it is emptied and by the articles found strict account can be held of the nurses on duty at that time. "Make haste slowly" with linen, instruments, and anything else in hospital equipment, for all of it is of untold value when one wants it and has not any chance of getting it. A reprimand for such carelessness should be enough, but, if followed by a repetition of the offence, the supervisor would be justified in withdrawing some of the pupil's privileges or honors. The superintendent of nurses is deeply concerned here, and is not truly fulfilling the obligations of her

office if she is afraid or too busy to visit the operating room often and know all its workings. The operating-room supervisor is beneath her in rank and the two must work in unison. A new superintendent of nurses cannot expect to change all the operating-room methods, to the dismay of the surgeons, deepened, perhaps, by the innuendoes of an inethical operating-room supervisor. Both women would be at fault. The newcomer must study the situation first in its entirety, and only where it is inefficient, if she is clever enough to detect it, should she, by coöperation with the surgeons, correct the faults on the basis that her pupils must get the best training to be had. It is no longer necessary (to return to the point whence the digression was made) to count linen daily. A modern building is so equipped and laid out that linen cannot be stolen from it. The employees file out of one door past the offices, and cannot carry bundles or pad their persons without exciting suspicion. The supplies for operating are of a different texture, pattern, and make from the ward goods, and are marked distinctly. Ward supervisors finding operating linen in their stock should return it to its proper place at once, and report the same to the head laundress, to have the error in her department corrected. The "dirty" nurse who sends down the linen should, as a part of her training, see it through the laundry a few times, and have charge of it when it comes back, so that, knowing now exactly how long it will take, she can keep tab on every piece. When the patients are taken to the ward, every blanket or towel must be brought back and sent down the operating-room chute, not the ward chutes, lest time be lost owing to their less frequent service. A ward pupil "receiving" the ether patient must go over her with a fine-tooth comb to learn her condition so minutely that she pounces at once on any foreign body such as an operating-room chest blanket or pus-basin.

Building the stretcher is a lesson for the first day. In all lessons the supervisor, demonstrating, emphasizes

the points on which former pupils failed, and after doing the actual work, watches the pupil do it over. If the latter makes mistakes, she must do it again until she does it properly.

Classes in Anatomy.—The new "unscrubbed" nurse need not be kept entirely out of the anatomic features of the cases. She is present each morning at the small class held by the supervisor before a skeleton and a set of anatomic charts in the work-room, where, briefly but tersely, she sketches the site of each wound, hernia, cholecystectomy, or iridectomy, going more minutely, perhaps, into it with the nurse at the instrument-table. Here she builds for the future. The best supervisor is she who turns out the best finished products, "good futures" in operating-room nurses, as they say in the cotton market. It is not by isolating herself to fold cool, unimpassioned linen, talking with interns, making rounds through the wards, playing politics with the surgeons, or doing all the hard and delicate skilled work herself that a supervisor helps the hospital most fully. When pupils read these pages let them be assured that the hardest days they spend on this service are the days of which they will be proudest by and by, indeed, as soon as they get rested.

No head nurse can teach all she knows. No Latin master can give his pupils all his knowledge. But the hints and suggestions from attendants and interns who have watched many other operators and visited many other operating rooms should be heartily welcomed. No pupil can absorb all she hears. It would, therefore, be a sorry world if there were not a good safe way to avoid these two glaring defects. Make the pupil self-reliant. Do not try to cram her mind with facts, but teach her *how to know when she is ignorant*, and where to go for information. There are charts, books of rules, anatomy and materia medica text-books, surgeons, and nurses to consult when she is in doubt.

Impartiality.—Nurses in the operating room should not

be bribed or coaxed to lend themselves to the especial aggrandizement of any one surgeon. The doctors should maintain a strictly impersonal, business relation with them, and vice versa. Favors arising in the operating room to one man, though bestowed by a pupil, cause fusses all over the institution. A pupil must know that she is not to be swayed by emotion here above all places in the hospital. She must do for one only what she does for all, whether it be lending instruments, giving out supplies, or rendering more devoted service herself. There are rules written and unwritten that must be observed to keep an honorable course and a clean conscience. To act fairly and squarely toward the Directors, the Medical Board, the hospital staff, and the municipality is the largest and noblest interpretation of good operating-room work.

Relation Between the Operating Room and the Ward.—Operating-room work is studiously omitted in most state requirements, and yet it is the chief work of some private nurses going out to "set up," assist, and care for the patient until she is "over the operation." Others make a livelihood as office nurses where all minor surgery is performed. As the heads of clinics, others yet have to command as much knowledge of surgery as the retiring, secluded operating-room nurse. The superintendent of nurses must be familiar with all these fields, and have a secure feeling that her pupils are being equipped for these things so as to reflect credit on her.

One tactful pupil can dissolve the antagonism of years between wards and operating room by helping out the former in the thousand little crises that daily occur in this earnest life. (1) If a ward is anxious to have "hot things hot" for a case in shock as it goes down, she can keep them posted by phone as follows: "They have just finished sewing up." (2) If a surgeon intends, after operating, to do some difficult "stunt" on the ward, which is not expecting it, she can telephone to that ward, "Dr. —— is going to snip the frenum under Baby ——'s tongue, or retract the foreskin, or ligate his extra thumb," because,

on the other hand, it is a very mirthful moment on the wards when the operating-room forgets a sponge or a piece of drainage. If a pupil in her first six months has shown qualities that do not make for integrity and industry, endurance and foresight, she should be denied the training. Why tantalize a valuable supervisor? Why vex a surgeon? Why endanger a patient's life?

After reprimands, if the pupil makes good, let her take the training. If again, during the first weeks of her operating service, she falls from grace, pursue the same course. Many pupils have gone through their hospital work in a mechanical way; but such is the genius of the American people for organization that the modern girl catalogs what the hospital has to offer before entering, and asks for what she fears she will miss. Many girls' training has been absolutely unbalanced, too much night or medical or surgical work, and this is wrong. But they all endow with some very mysterious honor the operating-room service, and they ought to earn it, getting it preferably *at the end of the first year.*

Deportment.—The pupils must be of military deportment in obedience to each other, according to rank, in the matter of work, at the same time preserving a humane friendliness in the matter of help and privileges. It is not fair—and the supervisor should step in here—for one nurse, who is very fond of going out, to "trade nights" with a conscientious "drudge" who has no place to go; nor should one plead "malaise" or "migraine" oftener than another. When a pupil from the wards which may seem extravagant comes up to beg for dressings, she should not be met with savage looks. If her ward uses too much, its staff should come after hours and help make them or help sterilize them. The same thing may happen when they are in reversed positions. Besides, there should be limitless supplies for drainage cases, such as fecal fistulæ, gall-bladders, and "pus appendices," which the operating staff should inquire about and study carefully.

Eight-hour duty is just as possible in an operating room as in a ward. There are more pupils needed for this system in *any* ward or division. The chief argument opposed to it is "responsibility," but on account of the minute subdivision of all labor it means nothing. Miss A. can scrub up and come in to relieve Miss B. on instruments as soon as she knows "where the surgeon is at," silently and unobtrusively, just as well as any other time, as long as the supervisor remains through the case. Where the pupils are of vastly unequal skill, operations should be booked with this in view. For night work there should be pupils on the wards who "have had operating room" and can "take" any emergency. The supervisor should not have her rest broken year in and year out, with such meager pay that she cannot insure or pension herself. The pupils always do well, and the doctors help them more when left to themselves. Some hospitals put a nurse on regularly from noon to midnight to bear the brunt of the night work.

Priority of service on a ward comes before seniority in the school when an operating nurse relieves. The ward nurse may be a junior, and yet have all her ward affairs at her clever finger-tips. An operating-room pupil who may go there for a half-day or a Sunday should fit in gracefully, bowing to the judgment of the superintendent, the power behind the throne, instead of sulking, loafing, or picking faults.

Certain hospitals have given their most capable pupils scholarships in cash, from $50 to $100, as pin money to use while taking postgraduate work by the gracious consent of some large recognized institution which receives the outsider and gives her her chances, home, and accommodations in return for her labor. This gift frequently comes from the private treasure of one member of the board, but it is a good practice to establish in all schools, for all grades of work, through the auspices of the whole body of governors. Some nurses may be averse to surgery and yet wish to devote themselves to the care

of children, and they should stand an equal chance of such a scholarship.

Self-government is a priceless boon to the nurse—as inaugurated in many Western universities—and a vote by the nurses, serious and well-pondered, should be a big factor in awarding these scholarships.

All visitors, whether confessors or messengers, must be received with courtesy, and the burden of their being in that "Holy of Holies" placed on the office, where it belongs. This is a part of the nurse's training to "get along with the relatives" in private work. So great is the bond of affection in some families that the lonesome cry of the dying must be answered despite red tape and frowning walls: "Come with me, granny, come with me! I canna gang alone!"—and granny says, with brave eye, but trembling lip, "I'll gang wi' ye, laddie, as far as ever I can."

Genito-urinary Work.—It has been at different times and in different states a burning problem whether pupil nurses should be present at genito-urinary operations (male cases). The surgeons of the old school are the advisors of today, and having had their experience in the old-fashioned way, where the nurse was present at all operations, the gist of their counsel is to do the same with the modern pupil. Why not leave it to the option of the pupil? She is a separate entity, and need not take the *whole* of the system prescribed for her, holus-bolus, by people who do not know how a woman feels, especially since the whole operating-room period is omitted in the schedule of some states for nurses' training. In any university a man has the option of classics or modern languages, science, or arts. The future career of a nurse can decide her present choice for her. If she wishes to do army and navy work, district work, etc., she may decide to study genito-urinary work, and the opposite holds equally well. The ward work acquires no new skill from the fact that the nurses are present at these operations. The anatomic nature of these cases is such that the rigid

asepsis of abdominal cases is not applicable or necessary. Besides, orderlies can be taught to become quite skilful in waiting on the surgeons, and if reliable and well paid remain steadily on the staff, much more to the surgeon's advantage than the changing pupils. The extreme youth of the average pupil at present must be considered, too, in comparison to the age of the nurses of ten or twenty years ago. When the nurse is doing private duty after graduation she seldom if ever "specials" a "g.-u." case outside of hospital walls, and this work is usually assigned by any thoughtful superintendent to the older women, for many good reasons that need not be specified. Why, then, force this part of operating-room work on an unwilling pupil? The work can be easily cared for in the operating room by interns, who will undoubtedly have in their future office practice a very large percentage of this work, and who are naturally very eager to learn to relieve these conditions. Then, again, in private practice, a nurse following this branch of work is alone with her patient, while a surgeon always provides himself, in gynecology, with the chaperonage and assistance of an office-nurse or a relative to protect himself from slanderous tongues, just as much as to protect the patient. These questions are entitled to discussion by impartial modern minds of lay committee members as well as surgeons.

Moving Pictures.—By a little additional expense a moving-picture system can be established in the operating room for the education of the pupils, in which the field of operation is shown every inch of the way, also the instrument table, so that a nurse can easily learn why she must provide certain instruments and dressings. It will soon be possible, when a supervisor presents the day's schedule, to turn on a reel and a phonograph simultaneously, to see the actions and hear the explanations of a surgeon removing a ureteral calculus, or performing a herniotomy, or again, transplanting a graft from a tibia to a spine for Pott's disease, ununited fracture, or to an-

kylose a knee-joint. The nurse who has to "set up" for a certain case will be enabled to see just when the "spurters" will spurt, so as to know when to hand a ligature, or to see when the bone-dust ("sawdust") flies, so as to lay anew a sterile towel. This is the only way to solve the ancient difficulty voiced in a plaintive tone by thousands of nurses: "But I never can tell what he is doing!"

CHAPTER II

THE JUNIOR NURSE

"Life is a patchwork quilt, stitched on the background of Eternity, and padded out with the rags of Time. Strange colors we introduce! Here a dash of scarlet Passion, there a scrap of pure white Faith, then brown Doubt and pale green Ennui! Most of us, however, have to fall back on the dull drab of Work to fill out the spaces, and thank God for it, for it rests the tired eyes."

Quoted from an old, old issue of Toronto "Varsity"; student author unknown.

Her Numerous Duties.—This nurse's work seems hardest because it is new and apparently disconnected, a heterogeneous mass of "chores," a bewildering waiting on four people at once, all of whom equally insist on immediate notice, waiting for others to pass, finishing up what others begin, and jumping at every one's beck and call. Yet the "floater" is indispensable.

She must dust with a damp gauze cloth and a dry linen or cotton one, Bon Ami, and brown soap in all the rooms appointed to her—the sterilizing room, hopper room, dressing rooms, etc.—the anesthetic nurse doing her own portion and the scrubbed nurse the operating rooms. A marble pit should be scrubbed with Sapolio and dilute Labarraque's solution at the finish of each day's operating. She scrubs all basins with Sapolio and dilute Labarraque's solution, or, if rusted in spots, lets them stand at a slant, with a weak solution of oxalic acid until this disappears. (Oxalic acid must be kept in the poison closet.) She assists in moving unconscious patients and puts on binders or bandages, trying to show perfect skill in applying what she was taught in previous classes. She should be able to do it well before coming to the operating room, so as not to keep a patient on the stretcher until vomiting begins. In handling these

things on the stretcher long footstools must be used. A nurse cannot get any "purchase" on her work if she is too far above or below it. She may be asked to "set up"

Fig. 1.—Offering a glove case.

for cases shortly after entering on this service by cleaning the tables with carbolic acid (5 per cent.), then selecting and opening the proper table covers, and, after donning her cap, scrubbing, and donning a gown, laying these

covers in place. Teaching the junior to "set up" early facilitates running off a full program. She waits then on the instrument nurse—opening jars, collecting empty covers, tying gowns, and keeping everything picked up. In fastening gowns she touches no part of the garment but the tape nor the doctor's fingers. In removing sterile

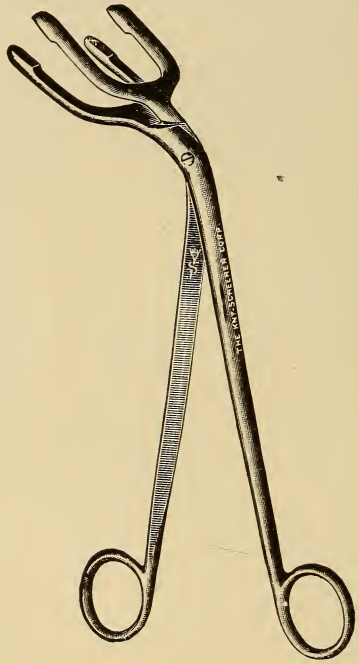


Fig. 2.—Sterilizer forceps for removing basins from the utensil sterilizer.

goods (Fig. 1) she holds them out from her body, and never carries a bundle under her armpit. She brings in the boiled instruments, holding them firmly at a distance before her, and not setting them down (for she would have to reach over a sterile cover), but waiting for the nurse to take them. She carefully washes all instruments that fall on the floor and boils them the right length of time,

specified in the house book of rules, with her eye on the clock over the sterilizers, from time to time looking in to see if she is needed in the main room. Forceps are to be used in lifting basins out of the utensil sterilizer (Fig. 2), so that a nurse's body need not hang over it. She may hold a sterile basin without letting her fingers come over the edge of it (compare with a well-taught maid handing one a dish of preserved fruit). She fills this basin with sterile water, holding it on her palm, first under the cold tap, second under the hot for her own comfort, and away from her body, so that possible dandruff will not drop in. These solutions should be tested by a glass thermometer kept in a disinfectant, lifted with forceps, and rinsed with sterile water before plunging into what may go on the eye or on the bowel. If it is too hot it will burn the patient or the surgeon; if if it is too cold the patient will be "shocked," and at the surgeon's language she herself will be shocked. She drops a sterile towel by means of the same sterile forceps over the arm tank of bichlorid when all are through immersing. She *must never take anything off the sterile tables.* The scrubbed nurse must drop them to her or hold them so that she can grasp them in a forceps. She *must think with every bit of her outer clothing., i. e.,* by practice she learns to judge distances, so as not to hang over or back against anything (Fig. 3). She takes nursing charge of the patient the moment the anesthetic nurse leaves, giving the anesthetist all the supplies he needs, and administering hypodermics at his order carefully and correctly, charting over her signature all the data regarding same.

She *washes* and boils every instrument inadvertently dropped, and in *bone-plating,* which demands most rigid asepsis, she *resterilizes every instrument every time* it is used, therefore keeping the small sterilizer boiling. She learns early to run the cautery, practising without a patient.

Sponges now are, fortunately, not counted, owing to

the speed of operating. A surgeon may put one sponge in the vagina as *backing* while suturing, but it should be simply a "coup d'esprit" to remember it. It is quite an honor to be asked to remember a plug or pledget some-

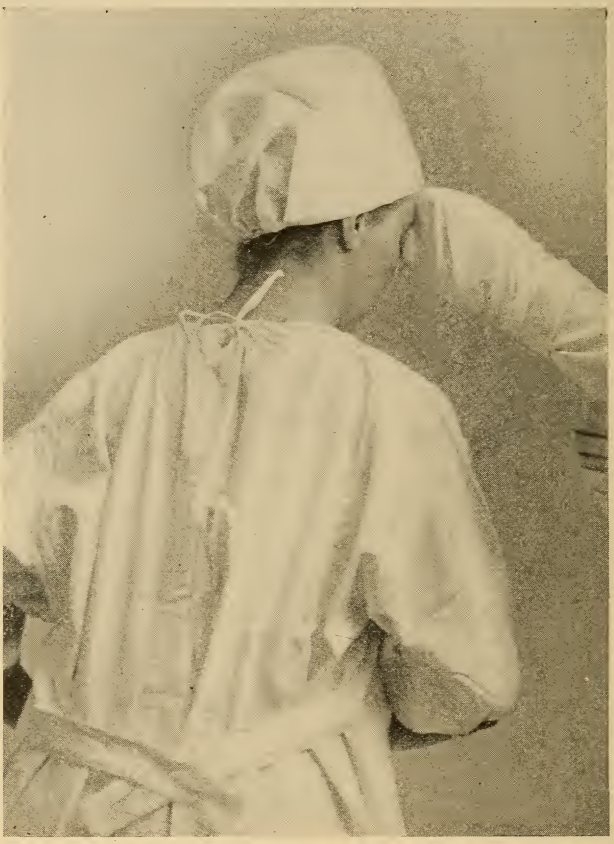


Fig. 3.—Wiping perspiration from a scrubbed nurse's brow.

where, and one does as easily as an invitation out to dinner, but to ask a nurse to count and handle a hundred bloody or pus-laden sponges was never right or necessary, especially for two reasons: (*a*) it took her mind off all the *instructive* details; (*b*) they bore infection.

She must turn to the blanket warmer if the patient goes into shock for warm wraps to restore him.

She should be put in the Trendelenburg and the Sims positions herself and then practise with the fattest women she can find, so as to learn where to adjust their knees, hips, etc. She must also wind up the table, if the anesthetist's mind must be confined to the anesthetic alone, though the modern tables make it easy for him. She wraps the patient's feet in a hot blanket so that they will not cool in mid air. She must learn by experience to judge how long she dare stay out of the main room when boiling up, going back to the patient, watch in hand, rather than be missing when needed. The surgeon should never be the one to insist on getting an instrument before it is boiled long enough.

After a case is concluded all the work is moved up a notch. She washes and changes the linen on the operating-table, where only one is used, gathers up all linen, throws bloody linen under the cold tap, puts on the binders, cleans basins, then if she knows how (it has been already recommended) scrubs up, and "sets up" while the senior nurse selects other instruments, wraps and boils them, and "scrubs up" later.

She keeps the scrub-up stands clean and supplied with brushes at all times. Dry sterilization and plenty of brushes obviate the difficulties formerly noticed in boiling so many kinds of things between cases.

She *must keep looking around for something to do.* Caps, masks, gowns, suits, towels, bandages, etc., are all replenished, and sterile sheets for the next case, which, however, are not opened until the supervisor begins to scrub, and which, also, are limited by arrangement to fixed numbers. She cleans the sterile tables with carbolic acid 1 : 20 before they are reset. The operating-table is the last thing to be used (where the patient is anesthetized on a stretcher), and the supervisor *need not be foolishly overdriven* by anyone in a false haste of preparation, aiding herself by somewhat *postponing the cleaning*

of this important piece, the changing of pillows, and wiping of the pad.

The *dirty nurse* puts on binders. It is very essential to have all sizes of good binders in sufficient numbers, and they must be properly applied, for surgical reasons. Obstetric binders press down from above. For laparotomies, they press upward from below. They must be measured around the widest part of the body, the curve of the hips, and all fittings taken from that point, darts carefully put in both below and above the hip curve to keep the pressure on the dressings secure. This is accompanied by a T-binder for vaginal work, which has a slightly different model for male patients, being split. The safety-pins should be rowed around the edge of a piece of Castile soap.

An ordinary Sloane breast-binder with a sleeve added makes an excellent binder for breast amputations.

After a first case the room should be cleaned and readjusted like magic if everyone knows her duty. The bichlorid solution in the arm tank is changed for a new operator, but not for a new case, unless used *during* the progress of a pus case.

The sterile basins for hand solutions are changed for every case. Nothing used for one case should be used for the second, or touch anything that will be used later. If a heavy smear of blue chalk is put unnoticed on a door knob or some other common object frequently handled by all the force, it gives a valuable lesson in the transmission of invisible bacteria.

The unscrubbed nurse watches visitors, presents them with armless gowns, and sees that they do not come in contact with sterile tables.

The shoulder-pieces for Trendelenburg are puzzling at first sight, but easily thought out. They must be well padded to prevent bruises or paralysis of the trapezius muscle. The bar running into the rings must be well nickel-plated, rustless, and lubricated. The stirrups must be similarly inspected and kept perfect. The loops of the

foot-rests must be perfectly understood, the arch of the foot resting on one half, the tendo Achillis on the other. The angle in each stirrup, directed outward, is to throw the patient's limbs farther apart to give the operator more room. In lithotomy, the patient's buttocks must hang over the end of the table so as to relax all the soft parts, and the Kelly pad should not slide down too far when the patient is placed "in situ." The apron of the pad must fall from the angle at which it is made.

The unscrubbed nurse may have to record the number of pairs of gloves or tubes of catgut used in an operation if the office makes specific charges to the patient for these.

As several operations succeed one another with great celerity, and the specialists desire to take home their instruments, the junior nurse must at this period learn the mechanism of every cautery, cystoscope, tonsil snare, or rheostat. Then she can, with the probable aid of the anesthetic nurse, clean them and put them together while their owner is in the shower-bath and the next case safely started. It helps greatly to have them soaking in cold water to loosen bloody particles, but this does not apply to some parts of a cystoscope, etc., *that are never wet.* While one case is being sutured, the scrubbed nurse should hand her junior all the instruments that will be needed for the next except the suture set, to be washed and started boiling. In a busy operating room much time is saved by putting each surgeon's instruments into separate large basins, of which there should be many, if they cannot be immediately cleaned, tagging each basin with the name of their owner. It is very easy, by using the brain behind one's eyes, to learn each man's instruments, but it is impossible if one's mind is on plays and dances during work hours.

By dusting, the junior learns where everything is and acquires the "location" habit.

She must instantly provide boric acid and argyrol if pus squirts into the surgeon's eyes, and carbolic acid and

alcohol with a clean probe if he jabs his finger with a needle.

When patients require catheterization, she saves the specimen, and marks it *at once* with the patient's name, not daring to trust her memory, *whether she is told to do so or not.* In cystoscopic work, she marks the left and right specimens with perfect accuracy, knowing this involves life or death for the patient.

She stands with the specimen basin (given her *without contact* by the scrubbed nurse), holding it from below, so that if the surgeon inadvertently touches it when he lays down the specimen he shall receive no contamination from her. Dermoid cysts, fetuses, and all other solids are saved as a routine, and preserved in formalin (4 per cent.). Getting this habit prevents one from absent-mindedly throwing away some priceless thing.

She can instantly procure sandbags of the right shape and size to adjust a head or limb to the surgeon's fancy.

She slaps ice towels on tonsil cases to restore consciousness and good circulation, or to relieve hemorrhage. She deftly turns the tonsil cases in their special long rubber sheet (2 yards by $\frac{1}{2}$ yard) so that they bleed into the pail at the surgeon's feet, where he may look for specimens and judge the amount of bleeding.

She prepares all solutions, irrigations, douches for hemorrhage, enemata, etc., and must be sure of her formulæ and accurate in their temperature, using a sterile thermometer every time, kept in a harmless antiseptic solution and plunged into the fluid by sterile forceps.

She is the logical person to prepare for intravenous infusion, lumbar puncture, or hypodermoclysis "on the table" without any agitation or mistakes.

After a long ether anesthesia she brings the lavage set, with a bucket for the return, and a pan of ice-water for a lubricant. This is also usual in peritonitis cases.

When she gets a hint that the patient will be a drainage case she asks if a Gatch bed will be used, and telephones this to the ward, so that the ether bed will be al-

tered in time for all to be in complete readiness when he goes down. This avoids delay in making him comfortable, and is much easier than with a stretcher beside the bed when the change is effected in the ward.

Fig. 4.—Dusting aristol on a wound.

She telephones general messages to the office or ward at the will of the surgeon or intern, or writes (and initials) orders in the ward order book at their dictation, viséd by the anesthetist.

She keeps work going on all the time behind the scenes

—linen soaking, washing or drying gloves, sorting covers as she takes them out, or running the big sterilizers.

She must drop acetanilid, aristol, or collodion on a new wound in an aseptic manner, wiping off the container with a bichlorid compress, and delicately winding a sterile towel around her right arm (Fig. 4).

She puts on any tourniquet for amputation or intravenous infusion, knowing the anatomy of the parts.

She is instructed by the engineer personally about all lights, switches, fuses, valves, stop-cocks, faucets, cold coils, water jackets, steam jackets, pet-cocks, foot-treads, gages, sprays, soapholders, waste-pipes, traps, and other forms of steam-fitting, plumbing, and electricity, according to a list drawn up by him and the supervisor. When nurses are taught these things it *reduces the stoppage of pipes*, etc., to almost nothing.

She must shave an emergency case or one improperly prepared "dry" with a steady hand and in a perfect manner. This necessitates frequent practice on the wards previously.

If there are flies in the vicinity they must be swatted (the woven wire bound in velvet being best), and all doors must be closed during a case.

When the "unscrubbing" nurse cleans the instrument cabinets she learns where to find things in a hurry by then asking what each is, and for what it is used, each shelf having its list of contents on a card lying in one corner, *in the order in which they are found*, from left to right. She replenishes the basin of calcium chlorid now deliquescent, used to keep down the humidity.

She has a stock there, too, of smear-glasses, slides, and swabs ready for immediate use.

In genito-urinary cases the scrubbed and junior nurses wait on the operator from behind screens. In hernia no exposé is necessary if extra towels be used under the laparotomy sheet. If nurses are excused or protected by a screen, they must render excellent assistance none the less.

Black rubber tracheotomy tubes, ivory-handled knives, etc., must not be boiled in a moment of thoughtless haste, ruining the shape of one and the material of the other.

The junior nurse must listen avidly to the words of every actor in this drama, but not to others. By knowing what they say she can make a shrewd forecast about what they will want next.

The junior class is given instruction in bandaging, even in their preliminary training, and they *must practice* on each other, on convalescent patients, and on the sick patients finally, timing themselves, and working under inspection, so that they can put on any bandage in the operating room if necessary. In the past it has been so badly done that the surgeons do it themselves, not hoping to find anyone who can.

When the supervisor habitually "scrubs," the junior is put in a hard position, being unable to confer with her in a crisis. She must whet all her senses to ten times their previous sharpness, remembering that here not the nurse is in charge, but a man who is under great tension due to the bigness of the stakes. He may only jerkily ejaculate his needs and get angry if not understood.

The junior nurse is the "eyes and ears and feet" of the staff, who may not leave their places. She must know their thoughts, and feel with their sense of touch, and see with their vision.

After a laparotomy, when vaginal drainage is desired, the operator slits the culdesac of Douglas, and *passes down* a piece of drainage (never from below up) into the bite of a uterine dressing forceps held in the vagina by the junior nurse with a gloved hand. This sterile glove must be ready. The nurse cannot do this well if she has not an accurate idea of the relative position of the bladder, uterus, and rectum. It requires a drawing or chart in the supervisor's morning lesson.

A small bunch of twigs (especially birch) is useful in whipping out the fibrin of blood-clots when searching for specimens.

To give an enema in haste the set should always be in readiness.

Washing soda should not be used in aluminum pans, nor on the aluminum handles of instruments.

A patient should always be protected from the cold rubber of a Kelly pad by a large soft towel. This pad is thoroughly scrubbed after each case and soaked in bichlorid. Some surgeons think it is never "clean."

When messages come in from the outside the junior nurse must transmit them exactly, realizing their importance for the doctor or the family needing him. There should be a pad of typed blank forms for this at the telephone.

Perspiration in the axillæ is inexcusable. The nurse must bathe twice a day if necessary, use plenty of *unscented powder*, and wear shields washed daily and dried in the sun.

For her own benefit, to save back-bending and for the cleanliness of everything she handles, garbage cans should open by a patent foot-tread.

Special Beds.—A case in which the bladder has been accidentally slit requires special instructions to the ward about making the bed. The top and bottom sections of a three-piece mattress are used, but in the center are laid four pillows longitudinally (two deep and two on each side), so that when she is laid on her face the retention catheters drop through into a urinal tied in the center of the spring beneath. The pillows are each covered with rubber, and the whole bandaged into position. The same holds for certain fracture cases in the disposal of a bed-pan.

For a *Murphy drip* the nurse can most easily get at her patient if the covers are divided in the center laterally. Protect the patient with a soft warm covering. Take four old blankets and fold each in half laterally. Spread a sheet over the bed, and on its upper half lay two blankets; then bring up over them the bottom half of the sheet, tucking it under their upper edge, and its under edge out over all as usual with any counterpane. Lay another

sheet over the bed, its bottom edge reaching barely to the edge of the mattress. On its lower half lay the two remaining blankets, and turn the sheet down over them in order to tuck it in at the foot. Pin the two sets together over the patient's hips. This permits any adjustment of a Murphy drip, etc., without disturbing the patient, and is excellent for a colon irrigation. Being ordered from the operating room it slightly concerns this chapter.

Gatch beds may be improvised by a back-rest, a pillow with a rubber cover to sit on, a small board under it on a long sheet folded many times over, diagonally, into a sling fastened at the head of the bed frame, extra pillows for the back and arms to rest on, and a rubber-covered pillow under the knees. A second long sheet sling with a folded sheet may be used as a foot-rest, tied to the parallel bars under the spring. The quick transmission of suggestions for such a preparation facilitate the maintenance of very friendly relations between operating room and ward.

CHAPTER III

THE ANESTHETIC NURSE

Positions for Operation.—This nurse's duties are so detailed that she will seem to need a whole book to herself. She first learns how to place patients in the various "positions" required for operating from demonstrations by the supervisor on the living subject. There are always convalescents in the women's ward who enjoy being thus honored. There is no use in preparing a patient for a position until she is thoroughly relaxed by her anesthetic, *i. e.*, when the anesthetist gives the order. Then it can be done quite easily. It is better to call for assistance than to take too long or to maul the patient about, since the tissues are most easily bruised when one is under an anesthetic. Some patients are very obstreperous, therefore wide bandages, sheets, etc., for mild restraint must always be at hand. Neither nurse nor orderly should throw himself across the abdomen of a struggling patient whose appendix is about to rupture. The restraint necessary must not be applied to the diseased part. Some most mysterious bruises, high on the shoulders—*e. g.*, in an appendix case—can only be accounted for by having forced the patient down on the table.

(1) *Dorsal Position.*—The patient is flat on her back, but her knees are flexed, so that her heels are near and on a level with her hips.

(2) *Kidney Position.*—The patient lies on her face with her arms above her head, and a cylindric rubber bag inflated with air under her abdomen, to push up the kidneys. A badly placed kidney rest annoys the surgeon, delays the operation, and possibly cuts off the patient's respirations, while the anesthetic nurse gets a black mark

in anatomy. If the patient's arms are under her body paralysis may ensue.

(3) *Sims Position.*—Always to be used in giving enemata except where a wound prevents it (and then only with the doctor's permission to do differently). The patient lies on her left side, her left knee drawn partly up to her chin, her right knee farther still—this opens up the way to the rectum and vagina. The hips and knees must form a straight line, parallel with the end of the table, and hanging slightly over it. A real Sims table has an extension on the left side for the feet. Her left arm is gently drawn out from before her breast and placed behind her, at the right of the table. Her chest should be flat on the table and her face turned to one side comfortably. Her right arm is above her head.

(4) *Lithotomy Position.*—The patient lies flat on the table, drawn down with the Kelly pad so far that her buttocks will hang *over the end* when the foot is dropped. Each foot is hung up in a stirrup which has a strap hanging from a snap, making two loops, which pass (1) up behind the heel and (2) under the instep. The screws of the stirrups work simply and must be kept well oiled, but they must be practised on before a patient reaches the operating suite. It is very wearing on a surgeon's temper to have to ask every day to have the patient "brought down a little further." The stirrups must always be kept in one conspicuous place.

(5) *Knee-chest Position.*—The patient is not anesthetized. She kneels on the operating-table as near the foot as possible (for cystoscopy, etc.), with her face down on the table and her breast down to her knees. She needs support from beneath her abdomen.

(6) *Trendelenburg Position.*—When a patient is placed in a recumbent position for a gynecologic operation it is well to expect a call for Trendelenburg. Her knees must be about 2 inches below the joint in the table, so that when the shelf drops the bulk of her calves will not prevent her knees from dropping parallel with it. Her limbs must be

securely pinned in a warm woolen blanket about one yard square, *brought around from behind* them, caught up

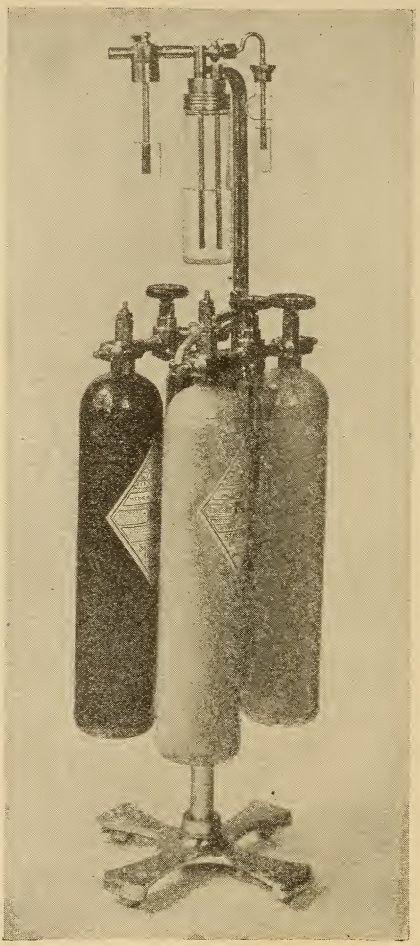


Fig. 5.—Gwathmey gas-oxygen apparatus.

at the feet into a pocket, and pinned in front. Her shoulders are rested against two shoulder props which must always be newly and fatly padded to prevent

paralysis of the trapezius muscle. The modern table is wound up or lowered at the anesthetist's will, and it is positively his business to notify the operator that he must lower her if she is "going bad." But the nurse herself should be placed in Trendelenburg by the supervisor, and should also learn all the mechanism of the table. There should be a pad for the table of rubber filled with air and hair, and with boxed edges, to prevent the patient from rolling off. The best method in any operating room is to prepare the patient on the table which the surgeon will use, and roll her in, all ready. This avoids lifting her once when anesthetized. It also prevents any of the customary awkwardnesses of arranging her on the table while every doctor waits. This system, of course, requires two tables of the same kind that are used in any special operations, but anything to save time is a gain.

Setting Up the Anesthetic Room.—The anesthetic nurse sets up her room with the various kinds of apparatus for anesthesia, the inhalers for gas-ether, gas-oxygen, or other anesthetics (Fig. 5), the tripods for gas tanks, the usual sizes of face masks, cones, or masks for chloroform and ether, according to the "drop" method and the "open" method, vaselin or K-Y for the patient's skin, bandages, and means for restraint, binders, chest blankets, large blankets, sheets, cloth stretchers (*i. e.*, small stout double sheet, $1\frac{1}{4}$ yards long by $\frac{1}{2}$ yard wide, of unbleached muslin, used in lifting), chloroform, ether, pins (straight and safety), a jack-knife to open ether cans, pus-basins with a high wall on the outer side to prevent a spray of vomitus, towels, sponges, mouth-wipes, two sponge forceps, tongue clamp (Fig. 6), tongue suture, mouth-gag (oral screw—Fig. 7—of black rubber), scratch pad and pencil, wrist watch for herself, pocket light, oxygen tank and its fixtures, stomach-tube, rubber cap for the patient's head or "ether" cap made with a towel (Fig. 8), bed-pan and urinal for nervous patients (with proper covers of muslin), special unsterile sheets for drap-

ing, triangles, extra large towels to lie between the triangles temporarily, bandage scissors, pads of gauze and cotton fitted to the eyes and bridge of the nose to prevent "ether eyes," and lastly, the stimulation tray.

The *stimulation tray* should contain only the drugs used during operations: (1) Morphin; (2) atropin; (3) strychnin; (4) digitalin; (5) whisky; (6) brandy; (7) camphor.

These are excellently prepared for emergency use in a form called the *Greeley* units, consisting of a small glass tube containing the dose specified on a legible printed slip, as strychnin, gr. $\frac{1}{60}$, a needle ready for injection,

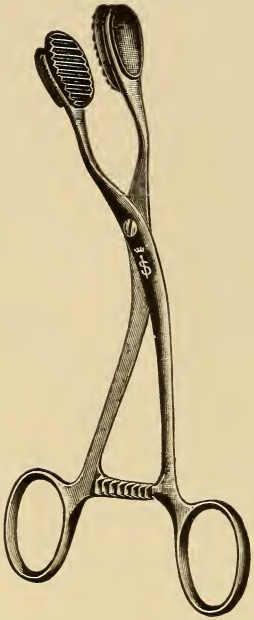


Fig. 6.—Tongue clamp with soft-rubber tips.

Fig. 7.—Mouth-gag. Oral screw, hard rubber or boxwood.

but protected by a sterile cover, and a small soft metal collapsible tube (on the principle of a cold cream tube) which, when squeezed, forces the fluid dose through the bared needle. There should be a large assortment of doses of each of these on hand. The drug, camphor, should always be kept in ampoules, and the *small files* coming with them *must not be lost.* Their contents are more easily drawn into a hypo. syringe from a sterile

spoon than from the ampoule itself. The glass of the ampoule must not be broken. The speed and the accuracy of the dose are two potent advantages in using ampoules and Greeley units.

Fig. 8.—A serviceable "ether" cap for all purposes.

The anesthetist's cap, jacket, and trousers are, of course, laid out in the dressing-room used by the surgeons, and need not be sterilized.

To produce speed in work there should be on the supply table of the anesthetic room a *standard* number

of articles of each kind, so that when the pile is reduced one can tell at a glance how many of each to get again. They should always be in a *fixed order* or *grouping*, so as to facilitate their instant selection by all. This is no place for a nurse's individual whims. When a valuable suggestion can be made, however, there is a correct time to do it and a correct way, that is, modestly, when the day's work is done. Otherwise all must follow the same routine.

When the patient arrives in the anesthetic room she is asked whether she has any false teeth, loose teeth, crowns, or bridges in her mouth, any hairpins, false hair, jewelry, or artificial parts, which all interfere with her own physical safety under anesthesia. The wedding ring may be tied on with $\frac{1}{2}$-inch tape, one knot in the ring, one double knot at the back of the wrist, and another below the palm.

Patients may desire to void urine again, through nervousness or long delays, and it cannot be reiterated too loudly or too often that a full bladder is a very dangerous condition under the knife. Free urine in the abdomen acts as a highly poisonous foreign body, the patient sometimes dying from absorption, while, on the other hand, the bladder walls heal slowly.

It is a solemn thing to a whole family when a patient takes an anesthetic. What nurse covets the opportunity? Put yourself in the patient's place. Do not talk while she is going under. The best anesthetic nurse will have a certain calm assurance, kindness, and dignified cheeriness that must be worn at all times, even when the operation will possibly prove fatal. The anesthetic nurse may be the last person the patient will ever see or the last one to whom she will speak. To the patient herself and to the family loss of consciousness is the big thing, not the operation at all. Most of us dread the consequent helplessness, and would bravely endure any pain to be allowed to know what was going on. The frequency of assisting and the almost universal success of all the

cases must not make a nurse treat them lightly, not even a child. It is a well-known fact that doctors and nurses are the worst sort of patients.

The gown must be loosened at the neck to permit distention of the blood-vessels during the period of excitement. The noise made by filling the gas-bag in the gas-ether apparatus should be got over with *before* the patient's eyes are covered. No delay is permissible after that. By good careful inspection of the apparatus leaks, etc., are detected. There should always be a reserve stock of ether and gas-bags with other rubber goods kept in a cool place in lycopodium or other powder. The patient must not be left alone for one moment from the time of her arrival in the anesthetic room.

The orderly who brings up the stretcher should disappear at once. He should not be seen by the women patients afterward. It makes them fear that he will be present during the operation, where, of course, he is never allowed. He may be called to assist in lifting the patient, though that is not necessary when she is anesthetized on the operating-table. Forethought and good executive ability are required to think out and define the detailed duties of each member of the company before the play begins.

The nurse may have to bestow sundry petty attentions on the anesthetist, especially if he be a stranger, but they are minimized by having everything in order on the supply tables. A good anesthetist will try to deflect the nurse's attention entirely to the patient and find what he needs before beginning the anesthetic.

In transferring from the operating-table to the stretcher (1) the anesthetist lifts the head and shoulders; (2) the anesthetic nurse and the orderly the middle of the body by means of the small stretcher sheet; (3) the operating-room "dirty nurse" the feet.

Similarly, in putting the patient to bed, these rules hold, except that the receiving nurse takes the feet. It is wisest to have no stretcher for special cases—run the oper-

ating-table to their bedside and take them upstairs on it. Again, some common cases of appendicitis, etc., are lodged in the bodies of highly nervous people, who wish to be anesthetized in the operating room, where they may face the worst. Let them have their way. Where an anesthetist ungallantly shirks in his share of the lifting, imperilling his patient's respirations, the operating surgeon should reprimand him. If he does not see it, the supervisor should report him. Lifting at a higher level than the point of one's greatest strength is not necessary or conducive to good health in women. Unison should prevail in points like these, but the supervisor should be granted especial authority to note and mention details of this sort, to "break in" new men, tactfully, of course, and always on the basis of the patient's best interests. The anesthetist counts "one, two, three!" and on "three" everyone lifts.

The arms require especial care at all times. In transit on a stretcher, they should be pinned on the chest and kept in place by the blanket, always brought up from beneath. In the dorsal and recumbent positions they are (1) placed parallel with the body, or (2) brought up above the head.

Problem of Nurses Giving Anesthetic.—Some nurses try to get as far away from nursing as possible after receiving their diploma. Among these are some "nurse anesthetists." The pupil "anesthetic nurse" watches the pulse for her own information only, but when asked what it is, should state the truth. Nurses never dissect nor vivisect, and cannot tell the deeper actions and reactions of chloroform or ether. It seems absurd, therefore, and dangerous too to qualify them as anesthetists and entrust them with lives to just as great a degree as the man with the scalpel. If a "nurse anesthetist" finds a patient "going bad" she cannot legally prescribe a hypodermic or an infusion. It is true that she may have a quicker intuition and sympathy with the patient, but this cannot be charted or justified in a court. Then, again,

what counts for more, she works for a low salary, much less than a physician's, and she cannot take any anatomic interest in the surgical procedure to distract her attention. But these factors cannot conscientiously atone for the dangers she creates by her ignorance. If a patient dies under an anesthetic given by a physician the relatives accept the situation philosophically, not dreaming to dispute his skill, but if in a nurse anesthetist's hands, what then? Then, too, nurses should not lend themselves to the exploitation of human flesh, unpardonable in any profession. A corporation should not make an ill-proportioned profit out of the services of any skilled employee. If a nurse anesthetist gives ten anesthetics per day at $10 each, and receives a salary of $60 per month, she is exploited like a slave, and, worse still, she helps the system along.

As soon as one case is well begun the anesthetic nurse arranges the stretcher and leaves. There should always be a binder of proper size on it for abdominal cases, so that they may be rubbed clean and dry, and lifted to the stretcher to be finished up. To facilitate putting on the binder rows of safety-pins are kept in Castile soap.

In odd minutes, waiting for an anesthetist, the nurse, if industrious, should make hundreds of yards of packing (Fig. 9). Before she is called to the third service, of "scrubbed nurse," she talks with the senior as they clean instruments together after cases, discussing how many of each and why all were used, or may help clean instruments so as to send them away with their owner after his case is over.

Oxygen may be conveniently handled in small tanks that can be lifted in one hand, or stand on a low tripod, like the nitrous oxid tanks. The large oxygen tanks can be rolled from place to place, first removing the fixtures. To administer oxygen properly is not difficult, but it is a source of many mistakes. A gauge can be bought at any first-class instrument maker's, and by unscrewing the nozzle for the fixtures, this may be screwed

on. It is a dial, which when opened shows at once how many pounds' pressure remain in the tank. All oxygen tanks in the hospital should be regularly tested, and there

Fig. 9.—Making packing from a bandage.

should always be one or more full tanks in reserve, according to the number of beds. The *oxygen weighs next to nothing.* One cannot tell by any means but the gauge whether a tank is full or empty without wasting it.

But it is expansive to the pushing strength of 250 pounds in the largest size of tanks provided for hospital consumption. On the tank hangs a bottle of clear glass containing clean water always fresh. Through the rubber cork go two bent glass tubes. The tube running down the lower must be under water. It is connected with the tank, and the oxygen must be forced into the water for three reasons: (1) It detects a leak; (2) it moistens the oxygen and renders it fit to breathe; (3) it helps us regulate the flow—it should be given at the rate of *three bubbles showing.*

The shorter glass tube is connected with the patient. If this is reversed, the water will be blown all over the place and the oxygen wasted. By using the gauge before and after, on certain cases, the amount used can be estimated and charged for at the hospital cost of 1 cent per pound. In ordering oxygen be sure to state that it must be odorless. If stored in stables it is very unpleasant. The distance of the factory from the hospital is a factor determining how soon to order again.

A small catheter well-lubricated except in the eye, or specially made flat nose-pieces of black rubber are best for ordinary stimulation, the funnel method having gone into disfavor. A lighted match shows that by the funnel method the oxygen ascends to the ceiling.

All oxygen face fixtures must be boiled and sunned after using, since in many cases they were used for lung diseases. The pneumococcus or tubercle bacillus could be thus directly transmitted if no prophylaxis were observed.

After the Operation.—The anesthetic nurse accompanies the patient to her bed, and goes over her thoroughly with the ward nurses to show that she has delivered her to them in good condition. She collects all her basins, blankets, etc., and returns to the operating room at once, to boil all masks, pus-basins, etc., before using them for another case.

The chart accompanies the patient downstairs, with

a slip fastened to it containing the important details of the operation. It may be used for reference during the case. If the patient has not voided before the anesthetic, this is *reported to the surgeon by the anesthetic* nurse, since she was the last one to converse with the ward nurse. It may be on the chart, but it must be verbally reported.

Tonsil cases are laid *face downward* on the stretcher when being taken to bed, with their arms above their head and their faces slightly turned for air, in order to swallow no blood.

Some very skilful surgeons keep drainage appendix cases on their face also, and the results are good.

The anesthetic nurse has several true nursing duties while in charge of her patient:

(1) She must keep him warmly covered, bringing up one *blanket from below* his body, then covering him with a head cover and a chest blanket, pinning his neck closely so that no air will get in while his pores are opened with ether, and pinning his sleeves to his chest to prevent fractures while in transit or being lifted to bed.

(2) She watches for hemorrhages and vomiting.

(3) She sees that the bed is clean, warm, and dry, and that there are no hot-water bottles anywhere in it; also that the rubber drawsheet was not superheated by them, to burn him.

(4) She learns how to hold the jaws to prevent a patient from swallowing his tongue, downward and back—practising on the class skeleton.

(5) She learns to sponge out mucus.

(6) She administers amyl nitrite—now prepared in dainty silk and lint covered tubes all ready to crush, the lint absorbing it, instead of the piece of gauze that was never at hand—the old-fashioned pearl was crushed in a piece of gauze by a firm hand or a weight, and held a few inches from the patient's face.

(7) She learns how to do artificial respiration slowly enough—16 strokes to the minute.

(8) She prevents burns by the use of a face lubricant, a hospital cold cream preferably.

Special anesthetics require a note here. *Spinal anesthesia*, a fascinating experiment, is seldom used, but has its special outfit. This is performed with the strictest asepsis, if such can be, on account of tapping the cord and putting germs in possibly with the anesthetic. The Medical Board should render decisions about anesthetics to be purchased and prepared by the hospital and its staff for ward cases, but for private cases each surgeon will be allowed his choice, within reason, at his patient's expense. Fads must be kept out. The good name of the hospital is in the trust of the Medical Board. An error of any sort in the choice of anesthetic should lead to a searching trial.

In *rectal anesthesia* the nurse's duties are prominent. She gives the enema—olive oil, ʒvj; ether, ʒij—mixed in an enamel graduate with a funnel, rubber tube, glass connecting tube, large male catheter lubricated, and an artery clamp, all these articles standing in a neat basin with a covering. The patient's face is covered, so that he rebreathes what his lungs eliminate. Then, after the operation is complete, the amount not yet absorbed is siphoned off with a larger tube (rectal) and the bowel flushed with cool water and soapsuds. One ounce of ether and three of oil are used for every 75 pounds of body weight.

Chloroform and ether deteriorate if exposed to air, and must be bought in containers as *small* as possible—ether, in ¼-pound cans; chloroform, 40 grams. In beginning a new case an anesthetist must open a new bottle. To carry it on, most men will use the left overs from a previous case. If not, use these ends for cleaning, keeping them in two stock jars. It is especially good for grease marks. Chloroform, ether, and ethyl chlorid must not be allowed to evaporate. That is wasteful. Chloroform masks may be covered with flannel, which is boiled after every case, thus getting so hard that it must be fre-

quently renewed. Anything more open of mesh will let drops through.

The *pulmotor* (Fig. 10) requires skilled care in cleaning, especially in not confusing the parts and closing off the wrong channels, but can be operated by anyone.

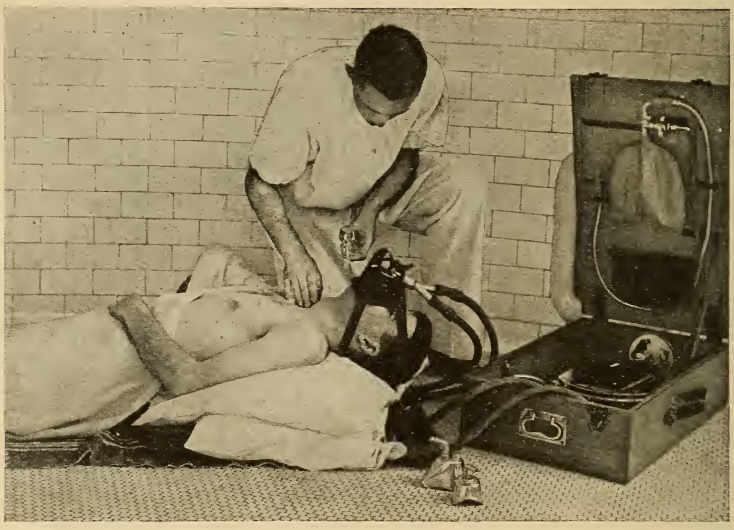


Fig. 10.—The pulmotor. For resuscitation of the apparently lifeless from the effects of anesthesia, poisonous gases, smoke, drowning, electricity, collapse from any cause. The operator applies a face mask and turns a key, starting the mechanism of the apparatus, to produce immediate and measured respiration, with pure oxygen entering the lungs at each inhalation. The tongue is held forward by forceps, and oxygen prevented from entering the esophagus by pressure with the right hand (Da Costa, *Modern Surgery*).

All syringes, as for spinal anesthesia, must be very thoroughly cleansed with cold water after containing human serum, which, if cooked, will ruin their working.

Pus-basins for vomitus should have a high outer wall.

The anesthetist should have a certain position for his table of supplies. When the nurse is coming in with the patient the orderly may carry this table to its place and provide him with his high stool.

The anesthetist is sometimes covered by a sheet, and must be especially assisted in small ways. When holding a child for staphylorrhaphy the nurse is also covered with a sheet, and should get some special attentions, since nothing is to be gained by smothering her in her own CO_2. A harelip infant recovers more smoothly the sooner it is operated on, and is held with its arms pinioned in a small towel up against the nurse's breast and neck.

To pin up a child, use a large face towel, or a small double muslin sheet made for such purposes. Lay the towel about its hips, the long edge horizontal, and pin once in front. Pin the child's cuffs together over its stomach, thus folding its arms down. Reverse the towel, so that it rises toward the head. Pin straight up the front. Then make darts of *equal size* on the shoulders.

CHAPTER IV

THE SCRUBBED NURSE

This nurse has fewer duties assigned her, but requiring much skill, physical endurance, patience, and the crystallizing of all she has previously learned to focus it on this particular case. A nurse in this position must keep good hours, wear sensible shoes, and conserve her energy so as to have a clear head and not give the wrong kind of needles or sutures. To save time the "dirty nurse" may cleanse the tables with carbolic acid solution (5 per cent.) and unpin all the packages to be used in setting up, while the senior puts on her cap and scrubs to set up, finally donning gloves and, as some insist, a gown. She spreads the covers on the tables, so that the part going over the edges is the last she touches, being pushed from her. She stands as far as possible from the table, so as not to let her gown, bib, or apron come in contact with it. Having set all her basins, etc., in order, she removes her gloves, scrubs again, dons her clean gown and new gloves.

The junior brings her the tray of boiled instruments, held away out before her, the senior using every such opportunity to teach her asepsis. The instruments should always be disposed on the table in a routine way, so that one may pick up a clamp without looking to bite a spurter.

Routine is not always to be adhered to, however, because it kills originality. The scrubbed nurse fastens the first four towels in place with towel clamps for the skin preparation, handing the assistant a sponge stick and a glass of iodin, followed by alcohol, which she *does not receive* back. She again fastens a set of towels around the

operative area, is assisted in placing the laparotomy sheet, and over it places four towels again, laying them on upside down, clamping at the upper edges, and then pulling them over, right side up, so that the towel clamps will not get mixed up with the operating instruments. She puts the scalpel, sponges, artery clamps, and mouse-tooth forceps on the towel, then swings her small instrument table into position, and the case begins. She washes blood off all instruments, keeps a supply of wipes and sponges, offers hot saline on tape sponges *when* the intestine is exposed, not *after*, offers ligatures, sutures, etc., noting all her mistakes (and vowing that they won't recur) until the case is completed. She must know the laws of ligatures and sutures, needles and instruments (*a*) from her text-book in anatomy; (*b*) from the book of house rules; (*c*) from the surgeon's own words; (*d*) from the text-books on operating-room work.

Sutures.—The surgeons will frown on extravagance as a bad omen for the pupil's private work in future, besides for their patient's bill, since the scrubbed nurse is supposed to count the amount she uses and charge it to the case in some institutions. The nurse must calculate it to an inch, and report all data, so as to enable the hospital to buy closely, so many short lengths of each kind, etc.

Long-handled Needles.—A special long-handled needle has recently been invented to sew up a hemorrhagic area after tonsillectomy.

Small Needles.—Thread them quickly. Cut catgut with a bias end, and *know* the needles, whether they have the eye at the side or back. Twist the thread on itself once or twice at the eye, after threading, and it will lie flat, place in the needle-holder one-third from the eye, the point projecting to the left for a right-handed surgeon, and hand to him with one bend of the wrist, throwing the handle into his palm, the mouth pointing back to the nurse, who catches the flying thread in her second and third fingers to keep it taut. As to shapes and their

uses, the head nurse makes up a sample card for instruction.

Needles for syringes should be slip-ons, since they are clean and easily worked. They must always have a stylet. Special needles for lumbar puncture have an eye, and the point of the stylet is bevelled.

Knives are right and left for throat work. If the edge has a full curve it is said to "belly." Blades set in a frame —*e. g.*, the tonsillotome—come under the classification of knives in their care. A paracentesis knife for myringotomy must have two blades, and go through the small end of any ear speculum.

Ligatures.—These are chosen according to the size and toughness of the part, their time for absorption, and the size and importance of the blood-vessels involved. They must be cut long enough for each and every operator to hold in a firm grip—*i. e.*, 9 inches.

Scissors are selected with a view to the anatomy of the part and the operator's hand. They are blunt or sharp pointed, straight or curved, curved on the flat (right or left), or curved upward, long or short.

Forceps are straight or with handles, plain or with mouse teeth, pivot, screw-lock or mortise-lock, corrugated or smooth, corrugated crosswise or lengthwise, straight, angular or specially curved, and of varying lengths. There are also special kinds of forceps: (*a*) placenta, (*b*) obstetric, (*c*) gastro-enterostomy, (*d*) gall-stone, etc. An artery clamp has such an important duty that it should never break, and the inferior molded forceps, though cheap, must give way to the superior though expensive "drop-forged" forceps.

Instruments generally should be known by their purpose, not by the inventor's or maker's name. They are chosen for operation according to its location, the depth of the wound, and the shape, size, and weight of the organs involved. Even then many must be covered with rubber tubing or buttons of soft rubber in order not to crush a delicate part—*e. g.*, the intestines.

Operators have many idiosyncrasies which must be mastered and noted in the book of house rules, as to what position best suits them, the height of the table, the sort of gloves, whether they are left-handed, or have lost a finger, etc. An old-fashioned table can be heightened by setting it in four pieces of iron gas-pipe of equal length, below which again are the casters.

Instructions in Conducting an Operating Room.—The scrubbed nurse receives her instruction in buying by visiting the office with the supervisor when she makes her weekly requisitions, as well as by discussing costs, materials, and makes while at work. On the spindle in the workroom is placed every item of goods running short, goods criticised by the operators, instruments they asked for, or anything else relating to the work of operating.

She collects all instruments for repair, sharpening or renickelling, under the supervisor's approval, and packs them for mailing, knives in their boxes, padded with the cheapest cotton, scissors rolled in the soft paper which came the week before, and all listed as to size, shape, and needs. One slip goes with them and one is kept in the main office, but the original list is made in the book for repair of instruments which is not destroyed, since it shows how certain kinds stand wear, while others may have to go too often to the repair shop, etc. The Instrument Committee is chosen from the surgeons, and they have control of the buying. Under the supervisor's direction she visits the wards, examines their instruments, ships them for repair, but never sends the only two of one kind at one time, and carefully decides about what to discard permanently. She takes all the night operations in some hospitals where the night force does not contain a nurse who "has had operating room." The supervisor should not have to take night cases, since it is most essential that she should have a clear mind and a rested body at all times. This induces the capable women to retain these positions. There should not be such a great disad-

vantage created in any one sort of position. The pupil may also relieve the supervisor for her time off. When it comes to vacations, the selection of a relief nurse comes before the hospital staff. She should be one acceptable to all branches of the service.

A little dissection of animals, fowl, and fish in the main kitchen under the direction of the dietetian makes a useful complement to this service for the scrubbed nurse, and proves just as interesting as it is useful.

The scrubbed nurse has charge of the plaster work, which is discussed in another chapter. She also looks after the cutting of gauze, rolling bandages, making dressing-covers, and the general work of getting supplies, watching three things: (1) the every-day supply, sterilized and circulating; (2) a reserve of sterilized goods, always kept up to a fixed, written standard; (3) a HUGE unsterile reserve of made-up goods, cotton, gauze, and muslin covers, so that there may always be plenty, no matter whether there be (*a*) a breakdown in the sterilizers; (*b*) an unusually large number of operating and pus cases; (*c*) or some epidemic among the nurses.

The scrubbed nurse sharpens her commoner instruments with strop and hone, or oil stone. She tests all instruments for sharpness, rust, bite or spring, making a drumhead out of the wrist of an old glove over an embroidery hoop for edges. If it cuts smoothly, the knife is sharp; if it is uneven, the knife is dull.

Business.—All parcels bear addresses, which should be carefully noted and memorized. Catalogs of the leading firms amply afford interesting and instructive study material through their illustrations.

Ambulance bags should be under the control of the operating room (unless the ambulance room has its own *graduate* nurse) so as to unify the supplies, especially of instruments. The bag should be sent up by the intern who rides the ambulance each time anything is used in it, instantly replenished, and instantly returned. The

special emergency goods for it are tourniquet, cord tape, cord instruments, mouth-gag, hypodermic set, packing, and small oxygen tanks. Here again is registered a protest against hospitals making their own catgut, since it has nothing whatever to do with a nurse's private duty.

General Hints.—1. Be sure to lubricate vaginal or rectal specula.

2. All thick heavy instruments must be thoroughly cooled in a deep basin of sterile water.

3. The scrubbed nurse must be ready to assist at the wound when called.

4. Slides, smear-glasses, etc., for specimens are kept in their own basin, apart.

5. Applicators must be wound correctly—

(*a*) So as to be fluffy at the end.
(*b*) So as to come apart easily.
(*c*) Cleansed by a second piece of cotton.
(*d*) So as to bury the end of the instrument so that it cannot inflict a wound.

6. Silk-gut sutures must never be buried.

7. Improvise a weighted speculum with a pail of water (quart) on the Sims.

8. Do not carry bundles of sterile goods near the body, better use a tray.

9. Practice taking the wires out of a tonsil snare.

10. If the nurse is left handed, she must correct that in passing instruments to a right-handed man.

11. She must instantly recognize the instruments owned by each surgeon on the staff—

(*a*) By the make.
(*b*) Shape.
(*c*) Age and condition.
(*d*) Numbers on the parts.

12. Note the numbers on all clamps, knives, etc.

13. *Use instruments to work with, at the sterile table.*

14. When the surgeon says, "There is one sponge in the vagina," don't let him forget it.

15. Wash the patient, dry her, and rub with alcohol

and powder, looking for burns from iodin, bruises, etc., before applying the binder.

16. See that the dirty nurse puts the binders on well, and have plenty of them, properly made.

17. Large abdominal retractors must be warmed to 100° F. to prevent shock.

18. Hand solutions that are too hot burn the doctor's hands and delay the operation.

19. Irrigating solutions must have an infusion thermometer inclosed in a connecting tube to show their temperature.

20. Chloroform seals rubber tissue for a neat skin dressing.

21. Have very many clamps for breast amputations and vaginal hysterectomies.

22. If called to sponge, press once deeply on the bleeding area (except the eye, an ulcer, or an appendix about to rupture) until the surgeon's hand approaches, then lift quickly.

23. Keep a generous stock of all sizes of sand-bags.

24. Keep a number of Politzer bags and plenty of rubber dam for cholecystectomy and rib resection for drainage by suction.

25. When aristol is shaken over a wound, see that the dirty nurse does so, with a wet bichlorid towel around the shaker and her own wrist.

26. When a Murphy button has been used for intestinal anastomosis, a very special notice must be issued by the scrubbed nurse to the ward nurses, and the "button" should be the subject of general comment until it is found (Fig. 11).

27. All pus, etc., must be confined to the towels on which it fell, and passed on to the other nurse to be disinfected. An effort is made to keep all dirt in as narrow a space as possible, and to make it harmless AT ONCE by disinfection.

28. Needles should be boiled in perforated metal (nickel) boxes (about 4 x 2 x $1\frac{1}{2}$ inches) for safety as

to number, care of the points, and the nurse's finger-tips.

29. Loose silk may be drawn into gauze before boiling.

30. Needles may be threaded with silk and drawn into gauze before boiling, or dry sterilized in flannel.

31. A man run over by an auto is a clean case, and yet, off the street, may have received the tetanus germ into his blood. At the first hint from the surgeon, the scrubbed nurse, listening intently, passes the suggestion on to the junior to get the hypo. ready for injecting antitetanus vaccine.

32. The points of needles require constant testing. Never boil up a dull needle. Test after boiling. Never

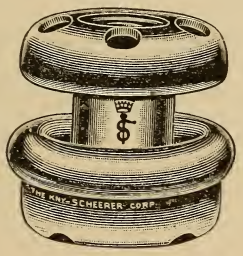


Fig. 11.—Murphy anastomosis button, round, with center collar.

hand a surgeon a dull needle. Keep a large stock to select from.

33. Scissors are tested on cotton. If they make a clean cut, at the tip first only, well and good. Then try the whole blade. Look for a gap between the points.

34. Artery clamps must fit exactly. If they are too loose or too tight someone will have to pick them from the floor where the angry surgeon threw them.

35. Always put the surgeon in good humor by laying down a *sharp scalpel for him to begin with.*

36. Pivot, mortise, screw (applied to clamps, scissors, etc.). See in instrument catalogs. A nurse's bandage scissors have a mortise lock, slipping into place,

a cleft over a bar, on the bias or bevel. A pair of household scissors have a screw lock. A pivot is a straight bar projection, fitting at right angles into a hole. All joints must be oiled after cleaning, and the oil may be boiled with them.

37. When a second case comes on, the scrubbed nurse—

(*a*) Sorts her instruments and adds what she had previously selected for the second case, cleaning and boiling them.

(*b*) Counts the used gloves into a basin.

(*c*) Removes gown and gloves and scrubs.

(*d*) Puts on new gown and gloves and "sets up" with the aid of another nurse, who opens drums or packages, or she does this herself before scrubbing.

(*e*) Sets up, and asks for instruments to be brought in, which she cools, sorts, etc.

(*f*) Is all ready with iodin, sponge stick, doctors' gowns, gloves, lap sheet, etc., when the others arrive.

38. The instrument nurse must wash and soak her gloved hands frequently during the progress of the case.

39. All tape sponges have a tape loop which is slipped into a heavy metal ring that hangs around an abdominal wound—this eliminates the *hateful* sponge count.

40. Sutures classified according to how they are taken, run in, and cut:

Guy. Temporarily put in with a long loop for traction in place of using vulsella.

Lembert. In and out at one side of the intestine, skipping the wound, and in and out through skin on the other side.

Through-and-through. Stout silk or silkworm-gut on long, heavy curved needle through the skin and deeper layers at once (but not the peritoneum).

Tier. Each layer by itself:
(*a*) Peritoneum—fine catgut on small round body full curved needle.
(*b*) Deep muscle—chromic gut, interrupted.
(*c*) Deep fascia—catgut.
(*d*) Skin—catgut, silk, gut, or adhesive only.

Buried. Never to be visible again; in deeper layers, and not involving the skin.

Running. One thread inserted several times without cutting.

Interrupted. Knotted and cut at each insertion.

Tension. A very long suture beginning several inches beyond the wound and passing through the skin and deeper layers.

Continuous. See Running.

Pursestring. A silk suture in the intestinal tract to invaginate a raw area (the stump of the appendix, for instance), on a straight fine cambric needle, all the way round in two directions, and poking in the raw gathered flesh, then tied securely.

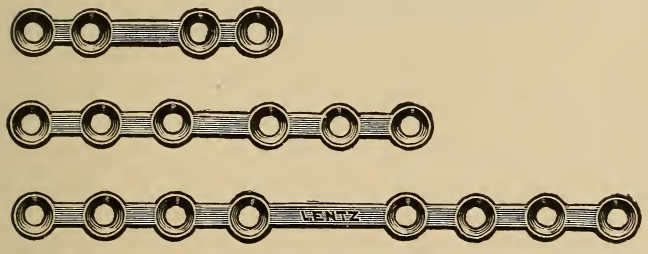


Fig. 12.—Lane's bone plates, steel, for femur, for use in fractures of bone.

41. If saline is used to mix hypos. in—*i. e.*, cocain, novocain, etc.—it possesses certain advantages:
(*a*) It is stimulating.
(*b*) It increases the blood-pressure.
(*c*) It aids absorption.

42. Hypodermic needles made of platinum are excellent. Though they cost about $2.50, it pays for the individual to have his own. They last forever.

43. Be generous with finger-cots.

44. In bone-plating, send the junior to boil *everything each time* the surgeon lays it down, before taking it on the sterile table again. This requires an extra assistant, and makes the operation long (Fig. 12).

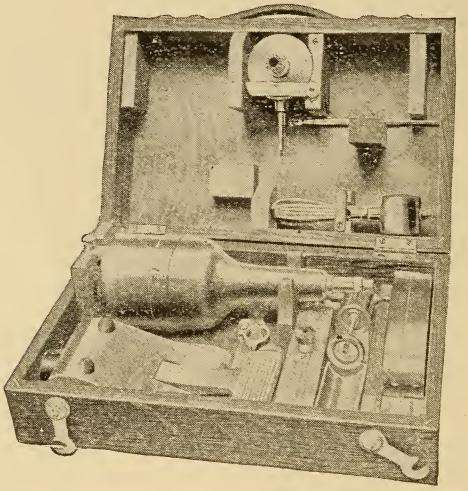


Fig. 13.—The Albee electro-operative bone set.

45. Do not boil electric apparatus, especially the electro-operative bone transplantation instruments (Fig. 13).

CHAPTER V

THE HEAD NURSE

Preparedness.—This head nurse has the work of building forethought, honesty, accuracy, and presence of mind into a pupil's character more than any other supervisor. But these all come from *preparedness*. By cooperation with the superintendent of nurses a sane system of minor penalties should be enforced, since the responsibility of conducting a case is so great. If a nurse is fatigued and does sloppy work, and it is found on investigation that she is using too many "late leaves," she should be deprived of them for a time. Not every pupil should get the operating-room service, because it is not compulsory and because dishonesty in doing simple ward dressings shows unfitness. If a nurse is honest and accurate in the details of ward work, she should be sent about the beginning of her second year to the operating room when anatomy comes on the curriculum, and before she begins to suffer from hospital fatigue. By getting this very early she can learn just as fast, and has no careless habits formed, while she is much more useful afterward on the wards in taking care of an intravenous infusion, blood-culture work, or phlebotomy without any agitation.

The operating room thus need not be disturbed for any ward treatments of greater magnitude. Besides, on her second night duty she can assume the whole or a large part of the conduct of a night emergency operation without depriving the tired day nurses of their share of rest. There is a general feeling that being in the operating room is a very honorable post, but this is not sufficiently utilized. The superintendent of nurses should

warn all pupils in the early stages of their career that they cannot make the operating room unless they do good work. If a pupil's first year work is poor, better expel her then than at the end of her third. It is absolutely criminal toward patients and unfair to a nurse to take three years of inferior work from her and not give her a diploma, while, again, giving her a diploma would make her the equal of good nurses in the eyes of the world. Considering then that a nurse is worthy to receive the training of the operating room, the supervisor has yet to show her a million new ways where she must be accurate, and many new things to resort to in new emergencies.

Discipline.—Perhaps a little more than the ward supervisor should the operating-room nurse be endowed with power to discipline. She and her nurses are in a world by themselves. The superintendent might see a pupil do something wrong, yet she should not take that pupil off duty for fear of disturbing the service, nor "go in over the supervisor's head." In a class of 20 pupils, in a school of 60 nurses, only two of one class probably are in the operating room at one time. If they were removed, possibly there might be nobody or only one available to take their place, whereas in ward work, which is more flexible, less concentrated, and among *conscious* patients, a nurse of even the senior class might not be much missed. But the superintendent and the supervisor should confer frequently at the end of the day and work together. The pupils should be kept at a distance, though all live on such a close footing. There should be no familiarity among themselves or toward the supervisor, who does the directing, while they listen silently, without chaff or banter. It sounds badly to a patient waiting to be anesthetized. She must say the same things over and over, and has no time to waste in repetition for inattention or absent-mindedness, though she must be patient with some who are dull at first. They should never lose their whole "time off" as a penalty, but they should not get it all if they loaf. If they do a thing badly, as cleaning, they should

lose the time thus wasted, and do it again at the sacrifice of a part of their "time off." Forwardness, quarrelling, noisiness of voice or manner, improper dress or toilet of the hair and person (perspiration, highly scented powders, and waters) should be checked *at once* by loss of the cap, degradation of position (put back from "instruments" to "dirty nurse," for instance), and other penalties in proportion to the offence. Ward nurses sending up a patient improperly shaved or badly prepared so that he stools on the table should be reported to and severely punished by the superintendent of nurses.

Teaching.—The head nurse must demonstrate all the work of the floor to her staff. This is severely eliminated by the demonstrator who teaches nursing all through the rest of the hospital because of the variations in technic. Let us hope it will soon be standardized! As the pupils ascend the scale—dirty nurse, anesthetic nurse, and instrument nurse—they must be *shown*. Then *they* should do the thing, for her to criticise, without any case. Then they should do the thing during the operations, with her standing back of them and helping them. If a perfect rotation of pupils is executed, they pass out to do night duty, and obviate thus the necessity of calling her. She should get perfect rest. She should maintain all her vigor, since she is a very valuable member of the staff. Night work, relief work, and vacation substitution always form an excellent school to give the pupils self-reliance. Like an infant, they must be made to stand alone. Even the least promising do well when left to themselves, being quite proud and feeling untrammelled.

When a nurse shows lack of theoretic knowledge, this should be reported to the teacher of those special subjects in which she failed, as anatomy or materia medica, and the points specified. Before each day's operations begin by a series of plates, charts, instrument catalogs, cards of samples, etc., she should teach the nurses their several duties for those cases on a very scientific basis, quizzing them on the anatomy of the parts and the nursing details.

She must demonstrate all the work of (1) scrubbing up; (2) the positions; (3) setting up; (4) binders; (5) opening all sterile goods; (6) making saline, etc.; (7) running all the sterilizers.

She must pay special attention to nice points in asepsis and technic, so that each pupil will feel it her stern duty to do these things with the same meticulous care: (1) folding linen; (2) opening a sterile towel; (3) setting up; (4) handing a needle-holder; (5) pouring out medications; (6) conducting a case.

She must instruct the senior in the special whims or methods of certain surgeons, with their reasons, so that they will not forget.

Details in Nursing.—Apart from the question of technic there is a great deal of general nursing care. A patient must not be poisoned with a too strong bichlorid of mercury solution, nor burned with iodin confined (*i. e.*, running down the buttocks to the spine), nor bruised by somebody leaning on her, nor paralyzed by standing upside down in Trendelenburg on shoulder-rests badly padded. The nurses should all follow up the cases in the wards and know how they are doing, whether they have primary union, whether packing is removed as specified, etc. The head nurse should confer frequently with the ward head nurses. The operating pupil bringing down a case should be "released" on the word of the nurse "receiving" him that his dressings, gown, and binder are O. K. The position of all hypodermic injections given in the operating room should be charted: "Strych. sulph., gr. $\frac{1}{30}$, by hypo., in the left upper arm, half-way up, on the outer side, given by Margery Daw." Blame is tossed forward and back from one service to another, until some one thus stamps the blame on the real wrong doer. The nurses must retain their "nursing" sense, and this is helped by sending them to the wards on Sundays and holidays to relieve. The patient's modesty must be considered whether under an anesthetic or not. She must be draped, and no exposure made where unnecessary at any time.

Colored physicians are not allowed to witness operations on any women but of their own race, as a rule, even in the charity wards. All tampons, packing, etc., must be reported to the wards. Conversation should be just as guarded as if the patient were listening. It is sometimes feared that standards are lowering. Formerly a nurse was completely disgraced if her patient was badly prepared. Now it is not properly reported to the superintendent, and the nurse is not punished enough, if at all—the result is, increasing indifference. The orderly should not be present when women are operated on for any condition.

Common Faults in Operating Rooms.—There should *never* be a complaint from the surgeon about the common subjects—(1) dulness of instruments and needles; (2) bad condition of the cautery or aspirating set. One should strive to be above all others in such things. One should learn from others' mistakes. One should avoid all the monotonous banalities of this life.

Legal Phases.—There are many features in which a trusty supervisor stands as the confidential agent of a busy or absent-minded surgeon who has grown to lean on her memory and judgment. In a new position a young nurse should not venture to assume some of these burdens, but after she has "made good" it may be relegated to her. At any rate, this is the time to teach the pupils that a minor cannot be operated on without the consent of his parents; that a woman's generative and other organs may not be removed without her own and her husband's consent when found diseased upon exploration; that all cases must be completely recorded, for reference in possible future lawsuits; that the patient's interests must be protected as well after he is anesthetized as before. A case is cited of a young girl undergoing the operation of tonsillectomy. Another physician accompanied her, and after she was anesthetized he asked permission of the surgeon to make a gynecologic examination, upon doing which he made certain remarks which showed clearly that

he had not been acting for some time as her physician, but merely wished to know what had transpired in the interval since he had had charge of her case. This need not have taken place at all in those surroundings. Once in a while when ethical courtesy is extended it is abused.

Routine.—There are many duties to be performed. In some hospitals all the surgical supplies are assigned to this supervisor, who distributes them on Saturdays (the best day to avoid the *old-fashioned Sunday dearth* of everything) on the ward requisitions. Rounds must be made over the whole floor daily for general cleanliness, weekly for special cleaning, and at other longer intervals for keeping up the good appearance given by painting and plastering. In the evening before going off duty it should be the regular duty of the supervisor to *know* that her staff is leaving its saline, infusion sets, etc., in perfect readiness for a night call, and that everything is done that can be done on that day. Let no work be carried over to another day. A book of house rules must be kept drawn up and at regular intervals revised by the Medical Board. There must be a general stock-taking on certain dates of—

(1) The ward dressings and linen (of a certain uniform design):

(*a*) In actual use.
(*b*) Sterilized reserve.
(*c*) Unsterilized reserve, done up in covers, ready.
(*d*) Fluffs, wipes, etc., made, but not put up.
(*e*) Empty covers (sorted), including what is in the laundry.

(2) The operating-room dressings (of different design) and linen:

(*a*) In actual use.
(*b*) Sterilized reserve.
(*c*) Unsterilized reserve, put up, ready.
(*d*) Fluffs, tapes, etc., sewed, but not put up.
(*e*) Empty covers (sorted), including what is in the laundry.

(3) The operating-room special goods—saline, tubing, pledgets, etc.

There should be a list made up of each class, with a number, agreed on by the superintendent, the superintendent of nurses, and the operating-room supervisor. She then feels free to order muslin to make enough covers or towels, etc., to keep up her stock. It allays anxiety to have a big reserve, and *it does not cost any more* once it is started. There should be a regular time for making saline solution, so that each pupil makes it so often, and it must be watched for cloudiness. But if there is a rush, it should be made at once, and if once sterilized, is good for the night at least. The nurses, maids, and orderly must be constantly supervised at all their work. By a daily slip the head nurse reports at the office all needed repairs and emergency supplies and her own "time off," since she is a very important official. The engineer cannot get good service out of his men if he does not get his requisitions early so as to assign them their work before 9 o'clock. A careful buyer has few emergency supplies to ask for. The nurses' work is completely mapped out for the day according to the schedule of operations listed in the office the evening previous. The supervisor should work the anesthetic nurse into minor operations, etc., when the "scrubbed nurse" is "off for her time" before her term is out in the anesthetic room, and so on with all of them. The pupils should not all go newly into the three positions on the same date. If the wards are extravagant with gauze the pupils there should come up and help make dressings at night for an hour, to see how it feels up there from that standpoint. The head nurse assists in buying goods for her department and instructs her senior pupil at the same time. She knows what sick cases use up the gauze and cotton. She knows how much work is required in cutting, folding, and sterilizing, and, having it in charge, she is not prone to hand it out too indulgently. But she also knows equally well which maker's instruments last

well, who does the best and quickest repairs, what kind of goods is satisfactory to the operators, and how the patient fares under a cheap ether or a new-fangled anesthetic. The patient first, last, and always! Any mechanic should have the choice of his tools, but when the superintendent says, "Why won't this gauze do?" there must be a scientific answer. It is sleazy, not enough threads to the inch, or cotton may be lumpy, friable, and dirty, rubber malodorous, or instruments ill-fitting and badly plated. The supervisor must encourage the pupils to tell every word of approval or complaint from the surgeons, investigating the latter, since she is really the medium between them and the office. They forget as they walk downstairs all the things they thought of under the stress of operating. It takes a "live wire" to do all these things to improve the surgical service and make it run smoothly. One nurse is appointed to care for all the instruments in the house; to see that ward sets are intact; to trace a missing one; to make the one who used it last pay for it; to list all needing repair; to check them off when they come back; to have some renickeled regularly; to exchange, with the supervisor's approval, poor ward instruments for fair duplicates, and get new for the operating room, subject to the instrument committee; to lend no apparatus without the consent of the surgeon on service; to get it back promptly, by frequent telephoning, from the forgetful borrower, and to give out no sterile dressings to any purchaser without an order from the office showing that he has paid for it or had it charged. At the end of each case the supervisor should "viser" each slip pinned on the chart for the ward nurse's immediate use, checking it up as to drainage, name of operation, etc., and she personally inspects each patient's condition as to pulse, wrappings, binder, etc., before he goes down to bed. She designates which tables will be used for certain cases. She maintains perfect decorum among all her staff, so that her commands—in a low, clear tone—may be easily grasped. Signs, frowns,

whispers are very ineffectual and confusing to a novice. Messages taken by a pupil outside are written, and if the supervisor judges them urgent are held in front of the surgeon's eyes. The assisting *intern must receive messages* while a case is on. Seven or eight other doctors and a hundred or more other patients have some claims on him. The head nurse also will keep an accurate account of all narcotics, under the Harrison law, as to amount received and how disposed of, of stimulants, such as brandy (hypos.) and whisky (enemata), of denatured alcohol (not designed for nurses' alcohol lamps nor orderlies' tippling), and of radium.

Sterile goods must be accessible for the benefit of the night staff through the night supervisor only, who renders a strict statement of instruments, saline, or dressings taken. The staff must take part in all fire-drills. She makes rounds on the wards irregularly to see whether sterile goods are wasted or not. She should encourage each ward nurse to build up in a small locked closet a reserve of dressings for night or other emergencies, and should help to foster a cordial feeling between day and night staffs. It must be repeated that a large sterile reserve is imperative in view of—

(1) Any epidemic among the pupils.

(2) A breakdown of the sterilizers or steam-fittings.

(3) A general calamity in the town—*i. e.*, fire, accident, etc.

She must direct the reading of her pupils on materials relating to their present work, especially of such authors as Dr. Brickner and Dr. Fowler. She must confer frequently with the housekeeper and the matron of the linen-room in regard to stains, bleaches, wear and tear, slow service, lost articles, patterns, materials, and suits. She sees that the nurses wash out all blood, feces, and clots before sending linen to the laundry, and that all iodin stains are removed first also. Use a doll's washboard for small articles in a sink with a stopper, and a

real laundry tub for large sheets to save time in the model "hopper" room. This is not the orderly's work.

It constitutes a part of a nurse's training to clean up everything after her case, especially unsightly blood. She must keep a well-bound register that will last forever, with the address of the maker and the number of the design pasted inside for reference in ordering again, and in case of fire this book should be saved. It contains a complete account of the case—patient's name, chart number, age, date, operator, all assistants, charge nurse, other nurses, operation, drainage, stimulation, dressings, anesthetics of various kinds, duration of each, anesthetist, patient's condition. She keeps also a book with a standard number of dressings, towels, and bandages allowed each ward that it must not exceed, and in giving out dressings daily usually exchanges empty for full covers, with the understanding that the balance is full on the ward. A special requisition for more must be obtained from the superintendent of nurses, who, if doing her duty, knows the exact needs of each patient. Pupils should not run promiscuously to the operating room for goods. But if, outside the fixed hour, an anxious little head nurse presents herself apologetically she should not be met with a stony glare. Give her the goods and investigate afterward. Bad management is not a crime and accidents or mistakes occur. Each ward nurse should order ahead, and should know a day ahead when new drains of rubber or the "cigarette" will be needed, not waiting until the surgeon comes. It is much better discipline to catch that pupil and make her do an hour's work on drains after she has finished on her ward.

She should look after the health of her staff, the cleanliness of their hair, the style of shoes, their throats, and their skin. Bichlorid rashes must be avoided. If they occur, nightly dressings of lanolin are best. Dutch Cleanser and other powerful agents for chasing dirt must be used only while wearing coarse rubber gloves by some thin-skinned folk. Nurses must wash off the

soap thoroughly before immersing in bichlorid, as the neglect of this causes a black scale and cracks. It is not necessary to scrub with a brush above the wrists. A nurse's skin is too fine. To dry the hands thoroughly each time they are wet and use a dash of hand lotion is effectual in saving the skin, and all this is for the general benefit. Keeping each nurse fit is advantageous to all. The supervisor requires alertness, suavity, self-control, a fine but not dominating sensitiveness, optimism, power to build a well-formed schedule for each day, and a well-defined plan for the future. These are some of the salient features we so gladly find in some and so sadly miss in others. Upon review of all the operating-room supervisors one has known, how many measure up to these standards? We cherished resentment for the time that one posed to the gallery of students (only in their third year at that), that another spent most of her time talking to the interns, or that a third had no head for management! But a supervisor in such a strenuous life needs a greater amount of vacation and change of scene, for why should she grow gray-haired faster than the others on the wards? Then it is the duty of the Directors to pay her such a salary that she can keep herself fit and retain the position long enough to work to their advantage.

Ethical Relation to the House.—The operating room is the common stamping-ground for men who have some reasons, real or fancied, for jealousy. The supervisor can do a great deal to quell or feed this by tact or gossip, by hustling a little, or complaining. She must be fair and just to all. No one man should be allowed to begin a case so late that he knows it will overrun his time allotted. But she cannot hinder him. The hospital committees decide that. She should report any whimsical technic, so that it may be regulated by the committee, who will back her strongly if she is honest. To be honest does not mean to hide things and to connive without words at favoring one.

The hospital must be humane, but it cannot undertake to use the time of its pupils to make dressings for sale or gift to any and every physician whose own family could easily learn. But if a doctor receives a hurry call while in the hospital, on the close of his morning rounds, when his supplies are gone, he can buy a few at what it costs to produce them. He should send back the covers promptly. If a physician presents a certain article to the hospital it should have no string to it. He should not keep borrowing it back, because had it not been given the hospital would have had one of its own. The making of saline is a delicate matter, seldom well done outside a hospital, but it does not undertake to make saline for sale or gift. People who need saline, dressings, etc., should come to the hospital as patients. However, some towns are very poorly equipped for contagion, and some hospitals charge tremendous prices, and all these questions need deliberation. The supervisor, therefore, must have no relations with the outside world professionally, except through a council of two people—(*a*) the superintendent of nurses, who should not lend herself to lowering the standards for caring for and teaching nurses; (*b*) the superintendent, who is supposed to know the policy of the Governors toward the municipality.

Advancement.—It is hoped that the wonderful work of the American Hospital Association will bear as much fruit in efforts to standardize operating-room technic as it has done in other spheres. The small hospitals were the first to call for this because they suffer more. The number of whims and the kinds of goods should be reduced to a minimum. The greater the surgeon, the fewer fads and instruments. Then, if the association helps operating-room nurses this way, it should standardize their attainments by demanding some proof of their fitness. If an examination, theoretic and practical, in operating-room technic were held every three years, and each operating nurse successfully passed and had her

certificate restamped, it would prove to a superintendent from whom she sought employment that she should make good, instead of being passed along, like a maid or a dressmaker, as at present, by only verbal commendation. Each operating-room nurse should visit other hospitals regularly, and should arrange similar visits for her pupils, for comparison, instruction, and maybe, also, self-congratulation at times. She should at all times successfully demonstrate economy for the benefit of not only the hospital, but her pupils' future careers. Ends of bandages may be used for packing. Edges of gauze-folds will make stuffing for pads. Catgut need not be thrown away if the pupil is taught the anatomy of the part to be sutured. Stains washed out will prevent destruction by strong bleaches. All the control of surgical goods in one hand centralizes and regulates their consumption. In a thousand ways, not by getting cheap materials, but by using every bit of good goods, are true economy exhibited and good results obtained.

CHAPTER VI

THE MAIN OPERATING ROOM

This subject has been admirably handled by many writers, but without quoting their opinions conclusions similar to theirs may frequently be worked out under somewhat similar conditions. It would be impossible to graft a really ideal operating room on an old plant. A hospital is a growth. But even one of the points here mentioned may prove of value in remodelling old buildings, and while all might not be possible in a new plant, yet they are suggested as a means of facilitating the labor of the surgeons and nurses, having been the result of years of actual work in various operating rooms (Fig. 14).

Position.—The operating suite should be cut off from the busy parts of the institution and yet be within easy reach. No odor of ether should offend the rank and file of visitors. No noise of visiting, laundry or garbage cans should disturb the surgeons. This should be a "holy of holies," to help clear thought, precise calculation, and quick, clean action. The **light** should not be from the direct rays of the sun, but preferably from the north, in these latitudes being more equally diffused and casting no strong shadows. A skylight is cold and uncleanly, but a glass wall projecting out 2 feet to the north, with east and west windows and storm sashes, is very excellent.

Ventilation by the direct method should be of a very simple, easy, yet germ-proof style, so that it may safely be operated by anyone, but not, however, thrown directly on the patient. In this projection, which is rendered opaque to cause privacy and prevent nurses from absent-mindedly staring out, should be set separate panes with a swinging leaded glass, preferably up and

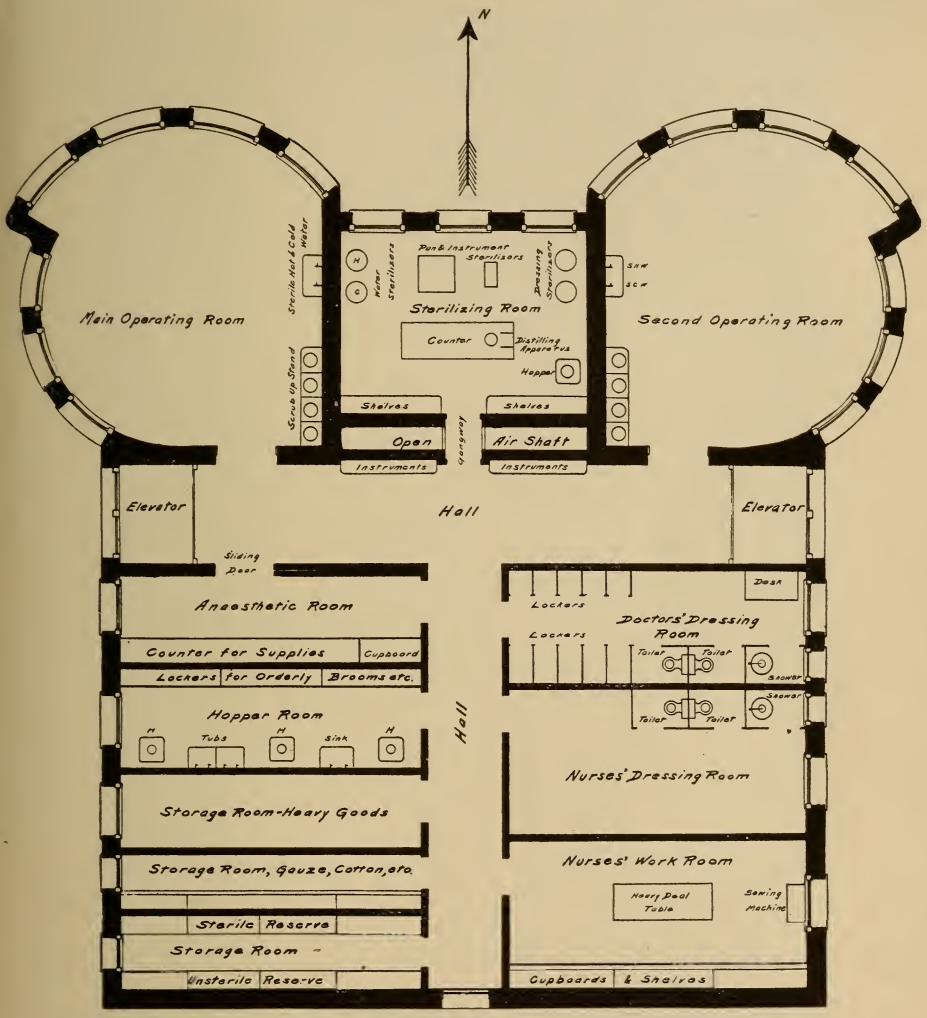


Fig. 14.—Model operating-room suite.

down, in a curved box following the path of the pane, the floor of this box being fitted with the finest wire netting. Frosted glass causes an equal diffusion of light.

Temperature.—The engineering department should be equipped to send *forced* drafts in summer of cool washed air, but unsteamed, from the sterilizing room, and in winter of warm washed but unsteamed air into the central room where the wounds are made. Hot-water heating (75° to 80° F.) is also quite favorably considered, in which case the radiators should be composed of coils so spaced as to permit easy daily cleaning, since cold air carries to them the dust which their heat redistributes. If on the floor radiators should be covered with white boxed muslin covers, laundered daily, to prevent that fan-shaped distribution of dust that clouds the walls, to say nothing of the vital statistics. There are modern hot-water coils built up the wall which largely obviate the dust trouble, since the coldest water is at the bottom. For the patient's sake the heat should be quite uniform when he passes from one room to another, especially going back to bed, since ether opens every pore. This uniformity of temperature is more likely to be wholesome for the nurses also, who perspire freely during operations. During the progress of a case the patient is quite scantily clad. Limbs suspended in mid air a long time grow very cold even in a warm room. Trendelenburg always gives cold feet. The staff, therefore, should dress lightly to endure the temperature which the patient needs. Common sense is necessary in judging what is suitable for nurses, the supervisor setting them an example in modesty and becomingness regarding caps, collars, neck-bands, sleeves, shoes, etc. There should be no *décolleté* effects. Outside the actual operating room the full uniform should be worn, *i. e.*, the moment a case is finished the nurses should take off cap and gown to clean up. Special gowns of light muslin or Indian head and caps of sheer lawn are devised for this purpose, and should be plentifully provided in all sizes and lengths.

It is positive cruelty as well as waste of effort to make human beings work in steam-laden air. Steam causes undue perspiration and loss of energy, spoils the instru-

ments standing in closed cases, and chips off paint. The sterilizing room should be cut off at its entrance from the rest of the suite by an *open-air corridor or shaft* from some roof-garden or balcony above and below. The pipes from the sterilizing room, running into the operating room from the sides, are not affected by this. It will take the fertile ingenuity of a modern architect to solve the problem of this open-air shaft, but it must be done. A skylight in the sterilizing room partly obviates the difficulty. The steam vents should be connected with the open air, but visible through glass. Until these two features—of an open-air shaft outside the entrance to the sterilizing room and hoods connected with the outer atmosphere over the steam vents—are worked out there will be a constant drain of energy for nothing. The steaming or boiling-up of instrument and utensil sterilizers, and the opening of certain windows to confine this steam where it belongs or to chase it outdoors, must in any case be carefully attended to by a thoughtful supervisor. It is not sane to confront a highly skilled professional man like a surgeon with the same disagreeable conditions that form the subject of eager charitable public investigation in factories, when he saves lives and the factories simply make paper or cloth. When a life is at stake, for one crucial space of time, everything preserving vigor and presence of mind is an asset for the whole municipality.

Corners.—Coved corners are best for ceiling and floor. To free the room from germs the best method is to turn on live steam for an hour by special pipes and other fixtures from the boiler-room, adjusted outside the operating-room door.

Fumigation is declared out of date, but if still resorted to requires special attention to these points:

(1) Leave one window unsealed, but closed.

(2) Put a damp towel over the face when entering to open up.

(3) Formaldehyd is a germicide ($KMnO_4$ ℥iv to formalin Oj to every 1000 cubic feet of air space).

(4) Sulphur is an insecticide only.

(5) Seal up all apertures connecting with hot-air shafts, etc.

(6) Protect the floor from stains by the overflow in the chemical reaction of the permanganate.

(7) Leave nothing inside that can be boiled or steam-sterilized, in case it may be needed.

(8) *Have some place else to work in if this room is closed.*

Any day a case *may* be operated on that shows typhoid bacilli, tuberculosis, or some of the exanthemata, and it is an important asset to be able to disinfect the whole room quickly and easily. In its broadest sense, the "operating room is never out of commission." Some special instrument might be needed the moment the live steam was turned on, and the impossibility of getting it might seriously delay another case. The operating room is in no sense a store-room, and it is not the cleanest room in the house, since purulent cases are opened up there, and people come off the street to view operations. There should always be a simple plain store- or stock-room nearby, well cared for, to work in for a day.

The **instrument cases** should be kept outside the operating room, with labels, tags, names, and numbers according to the kind of goods, the surgeon who owns them, their sizes, and other individual traits, so that they may be found in haste. An instrument should have a uniform name according to its purpose. On each shelf should lie a list of all the instruments on it.

We must distinguish between the sterilizers that are run for the whole house and those run for the immediate benefit of the patient on the table. For an operation everything needed in it should be as close as possible, and other things quite far away.

It is not advisable always for the supervisor to scrub. Careful drill on her part, talks in anatomy, lessons on sutures, a quiz before each case, and a graduated sequence of duties will fit her nurses to pass instruments. The most skilful nurse should be least hampered. Some women who are paid to supervise love to get into a sterile gown, intrenched behind which they give frowning orders that confound and perplex the pupil, making her resentful and conscious. If the surgeons do their share cheerfully in training the pupils, and show self-control, not anxiety, when a new pupil reaches the instrument table, they will be rewarded by enthusiastic devotion. All the arrangements of the operating room form the keys and stops of a big organ, and the best skilled player is the supervisor, but she cannot play a fugue by choosing only to work the bellows. She should be free to supervise a second case in another room, or in many rooms, according to the size of the institution.

Many small hospitals feel that they cannot afford a second small operating room for pus cases. This mooted question brings up the difficulty of diagnosing the presence of pus. In any case, a "septic" operating room should be steam-sterilized every time it is used, and left aseptic.

Dark Room.—Again, for all the "scopic" work, whether it be cystoscopic, laryngoscopic, or, again, submucous operating, the dark-room is necessary. Any room should be easily converted into a dark room, but it should not be one that might be needed simultaneously for another purpose. If the Medical Board would assume its responsibility this could be decided by the amount of work done by the man desiring the "dark room." If his cases are very few, they could be done at night in the main room. It makes for uncleanliness to have roller shades in the main room. Frosted glass only is desirable by day. But a fair way to settle all questions of privilege and necessity is not by a hole-and-corner caucus of a few, but by open discussion between the two Boards.

Plumbing.—The scrub-up stands should be in the main room, but not used for any but the case in progress. Plumbing for these is a vexed question. The knee-swell is an excellent thing in theory, but its parts have not been made strong enough throughout to bear the strength necessary to open the valves. The foot-tread has worked out best in most cases. There should be only one faucet containing mixed hot and cold water, and no stoppers in the bottom, since the hands must not touch any but fresh-flowing water. It is imperative to have an easy but always reliable adjustment of the temperature of the water, since frozen or scalded fingers are more susceptible to bichlorid-poisoning and less capable of palpating or holding delicate structures. The soap should drop from jars above the basin by means of a push with the elbow. The nurse cleaning this room in the morning should, therefore, be responsible for this plumbing. If it is not in order, she should move heaven and earth to get it in order in time for her case. When repairs are in progress anywhere in the hospital the arrangements should not interfere with the operating room, if avoidable; but if the hot or cold water must be cut off, the head nurse should stipulate, as her duty to her cases, at what hours it may best be done per schedule for the day. In cases of accident some one should hasten to turn the taps in the largest tanks before it is cut off entirely. When the engineer turns it on again after the repairs the inevitable sediment should not be allowed to flow over linen or delicate instruments.

Faucets are installed in the main room running from the sterilizers, and these are cleansed with disinfectants at the mouth every morning. They are controlled by foot-treads or knee-swells, but the orderly will have polished them. They supply the basins for rinsing gloved hands, for washing instruments during cases, the irrigating tank, etc. Faucets for ordinary hot and cold unsterilized water are also needed for the scrub-up stands.

The **table** and **cabinets** should be made of nicalloy. It is substantial, durable, and handsome, besides being easily cleaned. To establish the system of anesthetizing the patient on the table and wheeling him in (to save lifting and bruises) such a table should have a very broad pedestal or four legs, with solid, low, broad casters. This table should be selected by the surgeons of the staff in committee, each trying to *dispense with* instead of *demand* a number of unnecessary fixtures. All handles and levers for Trendelenburg should be controlled by the anesthetist, who is responsible for the patient's life. He must act quickly. The old-fashioned table can be raised for a tall surgeon by setting it in four equal lengths of stout gas-pipe, a solid bar inside each leg, running up into it and down into the gas-pipe.

There should be stools of graded heights, shapes, and lengths for the assistants at a case requiring Trendelenburg, and as seats for the anesthetists or nurses. It should be an understood thing that a nurse might be seated for a few moments rather than stand to the point of exhaustion. Her internal mechanism demands it. She is on duty in the operating room all day. The surgeon does one case or so and departs. A few moments in a different posture plus the knowledge that one has that privilege help drive away fatigue.

Electricity is used in many forms. The engineer is called upon to demonstrate and teach the meaning of the following: (*a*) Direct current *vs.* alternating current; (*b*) transformer; (*c*) rheostat; (*d*) switch; (*e*) watt; (*f*) cystoscope, etc.; (*g*) battery; (*h*) dry cells; (*i*) storage; (*j*) fuse; (*k*) motor; (*l*) dynamo; (*m*) cautery.

Every common fact about electricity must be known, so that the pupils may handle an auriscope or a cautery without damaging it. Bulbs should not be screwed in and out when the current is on, for fear of blowing out the fuse and putting out the lights on one line. There should be chains on each separate high light, so as to enable a short nurse to turn off all but one. When con-

necting up an electric instrument the light should be *tested,* then *turned off,* until the adjustment is made.

Electric light is used in many forms. By day in a dull climate electric reflectors are used, and possess many advantages if sufficiently high to be diffused, especially in old institutions. For a small operating room in an ordinary town service six powerful 100-watt Tungstens make an excellent night light. They should be up too high to burn a tall surgeon's head. A ground-glass plate is slung beneath them, as long and wide as the whole chandelier, making no strong shadows and preventing dust or burns. Again, the whole ceiling is sometimes of ground glass with electric lights above it in an arched or angled attic, where, of course, only the electrician can repair and exchange bulbs and fixtures. Still better is the wonderful Zeiss light which is generated outside the operating room, and is thrown in upon a large number of mirrors, whence it falls in six or more intensively illuminating direct pencils upon the wound. These pencils of light do not cast a shadow if a person intercepts them. The outfit is expensive and at present impossible to obtain. Frosted or ground-glass bulbs are necessary for eye work. Every sort of droplight, to be held by hand or on a flexible metal coil, should be provided and wound with sterile gauze. Patients under anesthesia are easily burned by lights if held too near or left lying on them. The "rolling stock" of casters and rollers should be so arranged that while one part is away for repairs, there is a good duplicate in its place. If the surgeon wishes the table immobilized the casters may be removed. Lock rollers are a good device for this purpose.

A *silent clock,* which simply throws out a sheet announcing the hour and minute in big black letters, is a very pleasing feature, as used by the M. E. Hospital in Brooklyn.

Instrument and sponge tables should have only one shelf, so as to save the nurse her clumsy efforts to be aseptic by stooping, winding the table in bichlorid towels,

and struggling with shelf covers always quite too large or too small. Everything to be used for the patient should be on a level with his body as he lies flat on the table. You know about how long floppy, sloppy sheets remain "sterile" below the level of one's knee. Operating has been so speeded up and simplified of late that fewer materials are required. Result, the scrubbed nurse has fewer "impedimenta."

In a private house the hostess has at her foot, under the dining-room table, an electric push-button to summon the maid. Similar bells ought to be provided for the scrubbed nurse. If the unscrubbed nurse goes out to boil up an instrument she need not stay with it. She may be thus summoned. It is an agonizing and monotonous feature of breaking in new nurses to teach them. how to know where to be.

Special Table Pads.—On the stretchers and table should be stout pads of curled hair specially bought for the purpose, instead of folded blankets renewed so seldom as to be thin and hard, the mother of a hundred bedsores, especially on a sick, emaciated patient hanging by the coccyx in a lithotomy position for one-half hour or more.

Tonsil Table.—Throat cases, when this branch of the service is heavy, should have a special table on which they may be slowly lifted to the sitting posture while under the anesthetic. The heart is overdriven by ether and weakened by chloroform, so the patient must be very cautiously raised, by the anesthetist only, to the operator's fancy. To prevent slipping, a seat of corrugated rubber matting is provided.

Cautery.—The fixtures for the cautery should be in the main room, at a proper angle, out of the way of the operator. There should be a low truck of heavy pine built, with a cover and solid casters, to move this heavy apparatus for cleaning, dusting, and cauterizing purposes.

Evacuating Cysts.—Provision must be made for removing in a cleanly manner the contents of large cysts or

purulent exudates. The operating room can be equipped with a large aspirating set, capable of drawing off several gallons of cystic fluid, if planned from the engineering department in the beginning. The smallest size of "H. D.

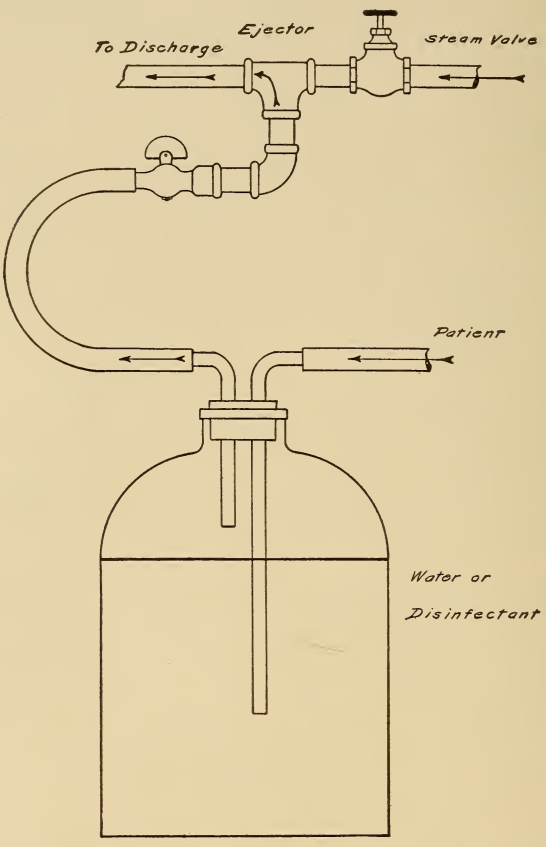


Fig. 15.—An H. D. ejector.

ejector" does the work most efficiently (Fig. 15). It is connected with high-pressure steam from the boiler-room and discharges to the atmosphere, *i. e.*, the outside air. To the suction opening of the ejector (*i. e.*, the wall of the

operating room) is connected a rubber tube leading to a bottle partly filled with water. From this bottle another tube goes to the patient (injection of aspirating needle). The fluid is started off by opening the valve at the wall. The fluid drawn passes into the water in the bottle, where it remains, while any air that may be drawn in at the same time passes on through the ejector to the atmosphere. When the air is all expelled the cystic fluid follows it to the atmosphere (*i. e.*, outside the building).

If a **radium outfit** is owned by the hospital it should be kept under lock and key, being very costly. Its powers are measured as "emanations" in units, called "mache units," so many thousand per minute.

Doors.—It is not good technic for the surgeon or nurse to pass through doors after scrubbing up, therefore there should be a row of four stands in the operating room. Five persons may be needed, but the two nurses need not scrub when the doctors do for two successive cases. In the first case they scrub first. Doors should be provided with the best of springs, set in boxes in the floor, to fly both ways, each having a window of wired glass, about 1 foot long and 2 feet wide, set in the bottom of the upper third of the door, flush with the wood, so as to distinguish the presence of anyone on the opposite side. This prevents costly head-on collisions, and should be uniform throughout the house, where swing-doors are needed, in pantries and lavatories.

Waste receptacles for empty covers or for the gory towels of a tonsil case, if they must be in the room, are metal frames on casters, with a bag of white duck or canvas inside, freshly laundered and changed for every case.

The irrigating tank should always be well oiled and dustless.

Other Rooms.—When a small hospital is being built on a limited scale its fixtures should allow of alteration—*e. g.*, from steam- to hot-water heating or from gas to electricity—but the Governors should plan to improve; to hitch their wagon to a star. Some companies have a draught-

ing department where the men must be kept busy, therefore for a small sum they draught and make blue-prints of operating-room suites according to the amount of money that the Board has to spend.

Off the main room, by communicating corridors, should be found—

Instrument cabinets.
Anesthetic room.
Store-rooms, for raw goods, sterilized goods, and dressings in wrappers.
Workroom.
Hopper room.
Sterilizing room.
Doctor's dressing-room, with showers, toilets, and lockers.
NURSES' DRESSING-ROOM, with shower and toilets.

This much is imperative. There may be, besides, "dark" and "septic" operating rooms, others for special work, as gynecology, or for some particular surgeon. There should be free currents of air and powerful light in all, and not any germ-laden holes under amphitheaters where these two disinfecting agents cannot penetrate. Where is the hospital that has provided decent conditions under which ALL of its nurses can work?

Preferably, the color of the walls is soft dull green with an unglossed finish so as to cast no high lights. Some operators prefer a lusterless pearl gray, but it is generally conceded that green is more restful. There must not be a sharp contrast between a wound, with its red blood, brown-gloved fingers, and white gauze, and the wall above, to which the surgeon lifts his eyes when concentrating his attention on what he is palpating.

Elevators.—It is very essential to be near the elevators and to have absolute control of that service. Everything stops when a patient is to be taken up or down except the services being rendered him. For fire-drill the elevator should go to the operating-room floor and stay there. In the equipment for fighting fire the operating-

room floor requires extinguishers and hand-stretchers just like other wings or floors, especially because the patient is unconscious. Drill should consist of turning down the hand grenades, carrying a patient down the stairs (if the elevator shaft were in flames), closing all doors and windows to prevent draughts, making an exit down the *fire escape which must be provided* for this suite, providing wet masks and blankets for all, manipulating the wheeled stretchers as necessary, and definitely appointing each his station.

CHAPTER VII

THE STERILIZING ROOM

The sterilizing room should be considered under the head of the operating-room suite, though in some very large purely surgical institutions it is conducted separately by a graduate nurse on account of the extensive, accurate work involved, though the obligations incurred have to be rendered to such an immediate neighbor that friction may occur where mistakes are made in the former. The sterilizing room should be cut off from the rest of the suite by a shaft of open air, especially easy when there is a loggia or balcony below and nothing above but roof or another loggia. The cold air coming up the shaft causes a condensation of vapor which otherwise would raise the temperature of the rooms and depress the vitality of the workers. Besides, cutting down this vapor saves the walls of the suite enormously from chipping of paint, falling plaster, etc. Cooled air can be forced up a flue from the engineering department, pushing out the vapor-laden atmosphere, while the air-shaft, lying between two solid walls and connected with the rest of the suite by stout swing-doors, need not be so wide that a nurse could grow chilled passing through. If it is bounded on the top by the sky it should be protected from rain and snow. The gangway should have high balustrades.

The sterilizers for water *should both contain a cold coil*, so that, no matter which one is the hotter or the lower, it can be cooled and used in emergency. Where this has been installed the supervisor states emphatically that it saves both time and anxiety. Each has two taps, one on a pipe into the operating room.

The sterilizers must be *run every day*, no matter whether there is operating or not. They should be large enough to

furnish water for twenty-four hours of steady operating —imagining a frightful contingency, such as a railroad wreck. There should be no extravagance, but there should always be a liberal supply of all those materials that it is impossible to prepare in a moment—cold sterile water, towels, gowns, and dressings. In small hospitals the steam is generated by gas, but these fixtures should be put in so as to be interchangeable with steam. *Damp dressings are not sterile.*

Nickel is the best-looking material, cleaned when cool with any good nickel polish. The suffocating smell from brass polish makes other metals undesirable. The taps from the sterilizers into the operating room, as well as those in the inner room, should be cleansed with green soap and a brush, then alcohol, then rinsed after the orderly polishes them. The body of the sterilizer may be set quite high, in order to obtain pressure on the operating-room side at delivery. It is a *sterile receptacle* which is brought to them always to be filled, and should be covered with a sterile towel if sent to the wards. Even though we know it is filtered and boiled, it must be observed as to color, cleanliness, etc., daily.

Filters.—There should be two filters for each set of sterilizers, one in use and one being cleansed and aired. Each nurse must learn how to run all of the sterilizers, since she has to do that work, not the orderly. A nurse should not pass up the care of this part of the equipment, since it demands a conscience and causes no fatigue. It requires some of the qualities of honesty and reliability that her diploma stands for.

Sterilizers are best placed on a solid pedestal with exposed fixtures and in the center of the room, not close to a wall. It is much easier to repair them. The utensil sterilizer should stand very low, so as to have no strain on a nurse's arm when she lifts out basins. Much more important is the height of the instrument boiler, which throws live steam in the face in most cases.

Engineer's Instructions.—The engineer's services are required in instructing pupils in the mysteries of water and steam, showing them the make-up of a valve, a water-jacket, a coil, a hydraulic lift. In their minds should be firmly fixed a diagram of the journey made by the steam so as to prevent future explosions, wet dressings, etc. One valve cannot be opened without affecting the whole system, and to open a series of valves in the wrong order may wreck the whole equipment.

A certain specialist in sterilization has declared that the live steam should circulate directly through the chamber of the dressing sterilizers all the time, and he has had the autoclave altered by the addition of a small vent at the front on the lower edge with a stop-cock. When the gauze shows 15 pounds' pressure, the stop-cock is opened so as to allow a tiny *stream of live steam to escape* with a shrill, whistling sound. This must be continuous during the half-hour. Besides, the theory is advanced that sterilization of a test-tube with only one open end is imperfect, and that the live steam must pass through them, with the result that all gauze packing is done up in *glass cylinders* with two open ends. There should be two dressing sterilizers at least, so that if one is out of order or if there is a heavy rush of work there need be no loss of time. Formerly drums for autoclaves were made so large that the nurses handling them were nearly killed, especially as orderlies are very ubiquitous. The small long autoclave, with drums about 16 inches in diameter, is found to be a great improvement. The round dressing sterilizer is best for holding flasks of saline. In packing drums what is needed first is put in last. The nurse packing it then drops in a slip bearing her own signature, so that if it holds any errors she will be reprimanded directly. This positively reduces the number of errors in packing. A drum is packed with the goods necessary for a certain kind of case, but, of course, the main supply of sterile dressings is also drawn on. If drums containing sterile goods stood idle a much larger outlay of

linen would be required. A specially designed low truck is used to draw the drums into the operating room.

In a busy time, in order to let the day nurses off earlier, the night staff should run the sterilizers, either before the patients go to sleep or after they waken. The fact results in the condition of having only the roof above that few if any could hear this. When the sterilizing room is walled off by an open-air shaft it may be operated during cases without disturbing the surgeons.

Tests for Complete Sterilization.—Several tests for perfect sterilization are to be had. There is a small tube which opens only when the right degree of heat is attained, and which is wrapped in a double muslin cover in the center of all the bundles or in the heart of the middle drum. When they are kept at 15 pounds for one-half hour and opened up, the fact of this tiny test-tube being open is proof that the sterilization was correctly done. Other tests are made with actual bacteria from cultures or smears. All gauze and cotton should be put up in double covers of stout muslin and used in the order of date of sterilizing. *Fractional* sterilization means for three days in succession, one-half hour at a time, to kill the spores. Tubes are closed with plugs of gauze and cotton, then wrapped in double muslin covers. This responds to the most accurate bacteriologic tests. Iodoform must be used occasionally and is sterilized in brown jars or brown glass tubes. To have covers plenty large enough to tuck in tightly (placing the contents diagonally) will dispense with a great deal of soreness in fingers useful for better purposes. A tailor's thimble with the end open helps in putting in pins. Filter-paper should be sterilized before making saline.

Distillation.—The sterilizing room is the proper place for distillation. The little plant for this can be installed near the corner with two faucets, one for the inner room and one for the operating room, the latter pipe running through the wall or isolated on the deal counter in the middle of the room. Distillation is imperative for cer-

tain uses in every department of the hospital. A small outfit, kept going steadily, produces enough at a very slight cost. Under certain climatic and topographic conditions even distilled water will make a cloudy saline solution, which, however, disappears usually on the application of heat. Distilled water should be drawn off into sterile containers and sterilized again, like saline, before using, since what is on the inside surface of the container itself may develop life, with the aid of the water, otherwise.

This room, which ought in one sense to be the cleanest of the whole suite, where utensils, linen dressings, and instruments are made ready to approach a wound, is *not* a proper place to scrub up in or to wash out bloody linen or pus. The former should be done by the nurse in the main room. The latter should be done in the hopper room; also the cleaning of instruments. On account of this room being cut off by a cold-air shaft nothing but sterilization should be done there in justice to the nurses.

This room needs a large *clock*, kept in perfect condition, to time the water and dressings by the code drawn up by the house pathologist and O. K.'d by the surgeons. To a busy nurse, alone in an outer room, an alarm clock set to go off at certain times is a priceless boon.

The utensil and instrument sterilizers should both be operated by a hydraulic lift, and a special pair of clamps, kept cleanly boiled, in the end of the latter to move the basins in the former, which are put in *face down*, so that they could be lifted out by hand if necessary.

A *glove sterilizer* where all the gloves are boiled separate from sharp-pointed instruments is a great luxury. This should be lined with a muslin bag to prevent the gloves from touching the metal. A thin layer of white muslin in any boiler aids one in counting all the instruments. The glove rack, like a hat-tree, thickly studded with finger-shaped prongs, a glove to a prong, stands here. The gloves must not be laid on a radiator.

Printed Instructions.—There should be printed codes of instructions on the following:

(1) At what regular dates to have all the equipment inspected by the manufacturers' agent and overhauled, with their address, for the purpose of getting emergency repairs quickly.

(2) Directions how to act in emergencies; *e. g.*, flooding of the utensil sterilizers, leaks, etc.

(3) Directions how to run each and every piece.

There should always be at least two persons on duty who understand the running of this apparatus. But printed rules are of no use until the supervisor has demonstrated every feature to her scholar and has seen the scholar do the same thing correctly and often enough to be automatic. It is wise in buying to secure a guarantee for all repairs for as many years as possible.

Infections Due to This Department.—Not all infections are traceable to the sterilizing room, if indeed, any are. But if a hernia becomes infected, which is a great disgrace, every means must be employed to ferret out the cause. The surgeon and the pathologist work here hand-in-hand, co-operating with the supervisor. Every avenue is opened to investigation. There is generally one definite cause and that not far to seek. If a series of infections occur, every gown and glove should be marked, traced, and set aside, as well as dressing-covers, basins, etc. The surgeon should relate the nature of all the cases he has handled elsewhere. Cultures taken on all hands, examination of new catgut, complete quarantine of dirty cases on the wards, cultures of the infected wound, examination of throats and nasal passages, a general washing of heads, etc., will lead to ultimate discovery and prevention. When cleaning up after a dirty case the nurse should scrape her *short finger-nails* across a cake of soap first.

Safety Devices.—The less complex the equipment, the more nearly certain the supervisor can be that her pupils are manipulating it properly when her back is turned.

All apparatus should have safety devices to prevent explosions. All the sterilizers should be controlled entirely by a lever in front. All steam fittings and plumbing should be quite far out from the wall to permit perfect polishing, dusting, painting, and repairs.

The **blanket warmer** stands in the sterilizing room, being heated by steam in a jacket. When a nurse goes for a blanket she should take one to leave in place of it, and a Turkish towel to wrap around the hot one.

Electricity for sterilizing is neat, but a cause of forgetfulness and destruction, therefore not to be recommended. Nurses have much on their minds and should not have to face this extra care.

Flooring.—On account of the immense amount of plumbing and the condensation of vapor the floor becomes very slippery, and a nurse in a hurry may sustain a bad fall. The lower floor should be impervious to moisture, but it may be laid suitably with strips of cork or corrugated rubber matting. "Safety first."

CHAPTER VIII

THE WORKROOMS

THE room in which dressings, plaster bandages, and all packages are made should be large, light, and airy to preserve the nurses' health and produce well-done tasks. Each nurse—head, scrubbed, anesthetic, and junior—should have her fixed place to work at, but if there are fewer nurses each *kind of work* should have its place and the nurse should go to it when ready. The windows should be of a very flexible adjustment, to admit air in large or small quantities without draughts. Along the inner wall there should be numerous cupboards to keep the goods in process of making only, as distinguished from the goods in bulk and those in covers or sterilized in reserve. The head nurse should have a solid well-built desk, with locked drawers, for the operating register, nurses' record cards, and similar data not to be handled by others. Here she can write out her records when the day is done. An electric desk lamp should be provided for night work. A spindle occupies a prominent place here, holding all the memoranda of the staff, and cleaned off daily. In the center of the room stands a long, low deal counter, always spotlessly clean, with stools or heavy solid *kitchen chairs* of *assorted heights* (from the floor), so arranged that the knees may go under the counter and the feet find rest on a bar down the center at the floor. Of all the work in the hospital the least provision has ever been made for what goes on behind the scenes in an operating room. Footstools and step-ladders are to be provided to reach the top shelves of cupboards, all of the latter bearing lists on the doors showing what they must contain. Stools should have holes in the

seat to lift them by, and, like the aseptic operating-room furniture, all should have rubber feet. A sewing-machine kept in good condition should stand with its left-hand end at a window, and not far away an ironing board and an electric iron, none of these to be used for the nurses' personal benefit, of course, but for covers and other special articles. Work cannot be efficient if done on the corner of a crowded table or put away helter skelter in one common cupboard.

(1) Do all one kind of work at one time.

(2) Have a place for everything and always restore it *immediately* to its place. Do not wait one moment.

(3) Clean everything away at night in such a manner that it can be resumed at once in the morning.

(4) Avoid continued conversation and do not become familiar and overfriendly.

(5) Do not make the workroom a scene of visiting by convalescents, friends, or physicians.

(6) Dust the workroom morning and evenings on account of the fluffy dust off all goods.

(7) Mark off the deal table in yards, halves, and quarters at each nurse's station, and out in front of her the various sizes of compresses, sponges, etc., in squares.

(8) Keep here various sets of labels and nurses' signatures to put on or drop into special packages, *i. e.*, infusion sets, drums, etc.

(9) Allow no loafing, but arrange that those fatigued by standing may rest, sitting with their feet off the floor.

(10) Preserve all introductory steps *toward* asepsis in the workroom, frequent washing of the hands, etc.

(11) For making special dressings—*i. e.*, boroglycerite tampons, iodoform gauze, etc.—use a thick glass slab on the deal work table.

(12) The floor should be of narrow hard-wood strips, which have more resilience than tiling. This applies to the store-rooms, dressing-rooms, etc., but not to the main operating room or sterilizing room, of course.

(13) Keep plenty of light supplied on dull days when work of a fine, close, or arduous nature is in progress, but fine the person a penny who leaves a light on when it is not in use, and devote the proceeds toward the purchase of some luxury.

(14) A set of teacups and a tea urn or coffee percolator *make largely* for content and good work so long as these tired nurses honorably avoid taking advantage of the privilege, and do not keep their one single luxury too much in evidence, especially when a patient is about to be anesthetized.

(15) The nurses should call one another by the same titles used in class, "Miss A., Miss B., etc., etc."

(16) There should always be some nurse on duty and so stationed that she may see visitors, answer queries, and present a neat appearance. While there is linen to wash out, etc., there should be no fewer than two on duty.

Hopper Room.—The hopper room should contain a high sink, several hoppers, and a set of tubs for rubbing out blood, feces or stains, and for disinfecting. When the tubs have plugs at the bottom it is not necessary to to have plugs in the hoppers. But in all fine drains are necessary to prevent the passage of cotton into the plumbing system. The hopper room should be constantly aired. Arrangements are necessary to notify the laundry when wet linen is sent down, so that it may be soaked again immediately, therefore a loud electric bell at the foot of the chute is wired to the operating-room floor for that purpose. The chute opens in the hopper room, and the button beside it is not rung for dry wash. One wall is lined with cupboards for mops, floor brushes, dusting-cloths, basins, etc., all of which are washed, boiled, or sunned before being put away. A set of three rings attached to screws arranged vertically on the walls makes an excellent broom or mop-holder. The cupboards should have only wire-screen doors in order to maintain a good airing system.

CHAPTER IX

ASEPSIS

Asepsis means the absence of pathogenic micro-organisms; in other words, freedom from dangerous germs.

Methods of Carrying Out Asepsis.—In the nurses' text-books on bacteriology is given a history of all the efforts of modern times to reduce operative surgery to a harmless process by excluding all dangerous germs from the field. Results are now almost as good as one can hope for, but, while scientists have almost reached their goal, the nurse must daily make the same tremendous effort and maintain the same ceaseless vigilance in running sterilizers or boiling instruments; in unfolding sterile goods or "setting up" for operation. Everything must be done "with a conscience." In past times when a superintendent wished to let a nurse down easy who was old or homely or hateful she generally described her as "conscientious," but nobody can really tell whether a nurse is conscientious or not without observing her every day, unless perhaps it be a very intelligent patient or the other nurse whose work dovetails into hers. The foundations of asepsis are "conscience" and intelligence. A head nurse must early drill her pupil into good habits of body, just like calisthenics, so as not to bump into sterile tables, until she can move about the operating room with ease and safety. A pupil should on this service act as if she had a set of delicate antennæ all over her person, warning her when she approaches "red-hot"—*i. e.*, sterile —goods. She must think with her elbows, the corners of her apron, or the peak of her cap, knowing how wide a margin of safety they require to keep away from sterile things in every direction—above, below, or at the side.

Then, too, in regard to boiling instruments or running the sterilizer, a head nurse cannot leave the ordinary unmechanical minded pupil alone with such complicated apparatus until she has absolutely mastered it, even after which she should quietly take note of the steps employed by the pupil to time herself in running it.

Damp Dressings.—If the dressings are damp the pupil should bravely confess it, dry them on a radiator through and through, and take her medicine by staying on after hours *to resterilize them*, having learned where she made her mistake. It must be made very impressive on these pupils' minds that dressings not sterilized may convey death to a patient as surely as a dose of prussic acid, and that dampness means no sterilization; worse than that, a gateway through the moist covers favorable to the entrance of disease-bearing bacteria. In the operating-room atmosphere pupils are prone to forget the living human being in the wards below for whom they exist. It is very wholesome, therefore, to have the operating-room staff relieve on the wards at regular times to observe the cases they have seen operated on, and to acquire an interest in the cases coming up to them. This takes away the danger of simply rushing goods through on a time-limit without caring whether they are done properly or not. By the way, when the pupils go to the wards to relieve they should display some skill in readjusting themselves to those conditions instead of loafing and putting on superior airs.

Dressings, gloves, gowns, and towels are now sterilized once a day for three days in succession in order to kill not only the germs but their spores. This necessitates a careful planning of cupboards and closets with wire doors for ventilation, so that what is finished (the third time) cannot be confused with what is run through only once. It defeats our object to let the unfinished goods lie around carelessly, exposed on dusty tables or open shelves or in a damp room. Whether put up in drums or loose in the older style sterilizer, they should

be marked, "Sterilized once, Jan. 10th," "Sterilized twice, Jan. 11th," and "Sterilized three times, Jan. 12th."

Mechanical Cleanliness.—The greatest care must be taken to procure ordinary mechanical cleanliness combined with sterilization. One must keep away all dust, K. Y. lubricant, liquids, particles, etc., from the goods to be placed around a wound. It is a great mistake to thrust a dusty bundle into a sterilizer thinking that will cure all defects. While operating, emptied covers should be collected in a *basket* and promptly sorted.

Covers for dressings are made of stout unbleached muslin of two thicknesses, with the name of the contents written or stencilled in ink on the outside. These covers are carefully stitched around three sides on the wrong side, then finished on the right by turning and closing, and present a good appearance. The oftener they are washed, the longer they stand the heat. It has been proved by bacteriologists that a germ cannot travel through a double cover within a reasonable time. A cover 12 inches square will hold six ordinary flat 4-inch gauze compresses, with plenty of room to open the package aseptically, *i. e.*, without touching the inside of it. The gauze is laid diagonally in the center, the first corner, then the two sides laid over, then the fourth corner folded over, tucked in flatly and deeply, then fastened with two pins, each buried with one insertion.

The nurse can here be shown a little point in preserving asepsis. If a pin were put in in the usual way, with two or three jabs, a person handling that bundle in the workroom might contaminate the exposed part of the pin with germs from the floor or the finger-nails. When the pin is pulled out this would be carried inside the cover directly to a compress, which, being used to sponge vigorously, carries the same germ deep into the wound. A little red ink or blue chalk would represent such germs on the exposed part of the pin.

Caps, Masks, Glasses.—The pupils must wear cool, tight-fitting caps of sheer lawn covering their hair en-

tirely to prevent dandruff from falling on the sterile table. They should adhere strictly to this, no matter how trying it may be to their persoual appearance. They must also stand erect, and not have any more of their person than can be helped *over* the table. In a recent case of intravenous infusion the arm was badly infected with a persistent condition locally which did not proceed from the saline. There was a moderate purulent discharge, followed by a ringworm appearance, which could only be accounted for by the possibility of dandruff, since three surgeons had their capless heads together over the arm, looking for the small vein. Ringworm treatment finally cleared it up after ten weeks' duration. By co-operation between operating room and laboratory the pupils learn what scarf-skin or dandruff looks like, or what effects either produces when injected into a guinea-pig. Besides, germs abound in the hair, which cannot be treated like the hands, therefore it should be kept very closely confined. To the good surgeon, good on the basis of working for the best results, the best-looking nurse is the one dressed most becomingly for her task. The operating room is a good place to study character, where people are stripped of some of their masks, and, working at high tension and unable to keep on guard, show themselves in their true colors.

The surgeons' caps and masks should be laid on the scrub-up stands, so that they may don them immediately after changing from their street clothes to their wash suits, but *before* they scrub and *before* they don their gowns. It is bad technic to have a nurse put one's cap and mask on after the gown and shake dandruff down on it. The caps should cover the hair completely, but be of light goods to minimize perspiration. Perspiration is of a very dangerous nature, containing, as it is an eliminative agent, all the poisons of the body. The operating room must be quite warm for the patient's sake, and high tension in work makes most men perspire profusely. The pupil who acts as "dirty nurse," or "unscrubbed,"

must move quickly when a man perspires. She winds a clean hand towel, not a dressing towel, around her right wrist so as to leave no floating ends, and as the surgeon leans his head away from the table, out of line with his body, she very firmly and slowly wipes, just as she dries her own face, with deep systematic strokes, not with faint tickling dabs (see Fig. 3). The operator's glasses must not be disturbed, since he prefers to set them himself, but his hands are in the wound. Blood on the glasses necessitates their removal and return after being washed with cold water. It is an awful catastrophe to drop them or break them with hot water, because that virtually blinds some men. Boric acid and argyrol (25 per cent.) should be kept in case of chances of infection from blood or pus.

Tests by Cultures.—Cultures should be taken from the nails of the surgeons and nurses after scrubbing up at irregular intervals. Some of the results are very appalling! Some hospitals have a "test day," when the pathologist comes to the operating room and takes cultures from all sorts of places—the door-knobs, saline solution, the hands of the staff, the buttons on the light switches, the dressings, etc.—to show the actual existence of bacteria. The operating room is a sort of clearing-house for bacteria in the hospital, anyway. Other institutions have a "monitor," a junior intern probably, appointed to come unexpectedly to watch for breaks in technic, to see if anyone who is at all concerned with the wound touches anything unsterile or if any sterile goods become contaminated. One set of pupils receive sufficient instruction from one set of cultures; *i. e.*, these visits can be made once each quarter, during the senior's last and the junior's earlier weeks.

There is a great inconsistency in the preparation of various kinds of goods by sterilization. The time limit and the number of pounds of pressure vary for rubber gloves, gauze, and iodoform packing. Then, too, in some institutions gloves are boiled. Sometimes sharp-edged

instruments are merely soaked in pure carbolic acid and alcohol or in lysol. Some hospitals use doubtful substitutes for lysol because they are cheap. It is the business of the pathologist to show the pupils that there are certain goods which can stand a long period but not a high degree of heat, and that the result is as good as if it were a shorter time and a higher temperature. We are told that a properly tempered steel blade is finished at 500° F., and that no boiling can spoil it; but not many hospitals buy blades as fine as that, and theirs are spoiled by boiling.

The basic principles in bacteriology are quite uniform throughout the world, and if the pathologists were pressed into service by the Medical Boards the technic for sterilization could be decided on in a way that would be almost uniform everywhere for each class of goods. It should be so simple that the average mind could easily comprehend it.

Tracing the Aseptic Chain.—Asepsis for the operating room should present the picture of a chain in the pupil's mind, each link being clean and free from germs to such a distance that it would be impossible for them to "crawl" or "fly" across or "fall" into the wound, or be carried thither by a swift random gesture of an assistant.

The skin is disinfected with iodin (2.5 per cent.) and alcohol (95 per cent.), the umbilicus being left in abdominal work to the last, and the sponge stick then thrown aside. Towels then bounding this area are now thrown aside also, and the new ones are unfolded (Fig. 16) at the level of the patient's body and not until the patient is reached (Fig. 17). They had lain on a sterile table freshly set up. They did not touch anything unsterile in transit. They came out of a package opened by the unscrubbed nurse in such a way that her hand did not touch the inside of the bundle. She pinched the corners in turn exteriorly, pulling them back like a snap-dragon.

The knife making the incision had been sterilized and laid on the sterile table; it had been handed to the sur-

geon's hand by an assistant whose gown had long sleeves and whose gloves were pulled on by the inside of the wrists, as they are done up in their packages, so that his bare fingers never touched the outside.

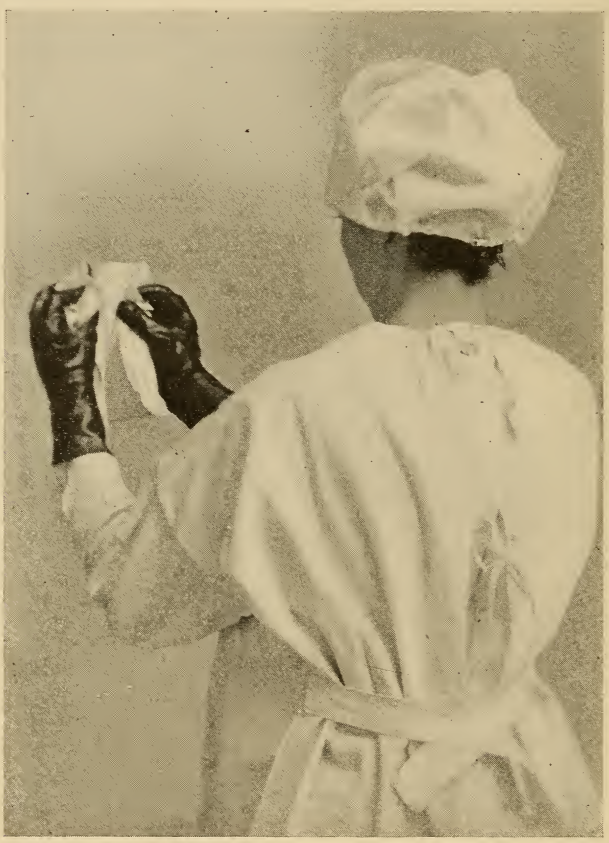


Fig. 16.—Opening towel properly folded (to the center twice).

The basin in which the surgeon occasionally rinses off his bloody gloves was steam-sterilized and lifted out by a nurse, either with forceps or holding it only by the outside, and supporting it from the bottom while being filled with sterile water at the sterilizer faucets. These basins

lie face down in the utensil sterilizer so that the steam will rise into them. The scrubbed nurse takes out what goes on the sterile tables, and the unscrubbed nurse what goes on the tripods.

Fig. 17.—Laying a sterile towel by the field of operation, opened only after passing the surgeon.

The moment an incision is made none of these things are any longer *sterile*, yet the operation proceeds with asepsis. Contact with the patient's blood and tissues has contaminated all the assistants, but they do not bring any

other germs to the patient. But his blood may contain typhoid, syphilis, or tuberculosis, and if injected into another living being might cause instant death. A surgeon should not say, "I can't write it now, I'm sterile," because he is not sterile any longer after he has exposed the subcutaneous tissue. He would not cut out a piece of that tissue and rub it in his own eyes. A part from that wound might infect the patient's own eyes. *Therefore*, nothing that has touched that patient, or that has during the operation been handled by anyone touching that patient, should be used in a second case without being sterilized again.

In setting up for a case the nurse should open as many packages as she is going to need before she scrubs, to help herself as much as she can. Many times in a private house she will have nobody to help her. All hospital training should point toward competent private nursing, and every official in the nursing department should have a couple of years of private experience in order to know what to prepare pupils to meet. Some pupils are guilty of scrubbing, then getting into their gowns, and then demanding the help of another nurse. "Every tub should stand on its own bottom" is a homely adage that applies well here. It teaches forethought, which is most essential in a well-developed character.

Some Errors in Technic.—It has already been said that germs travel through moist goods; therefore, since the table covers may be wet by drops of water from the basins or by blood, they should both be removed and the glass table top redisinfected with carbolic acid (5 per cent.) to render inert any bacteria found there before "setting up" for a second case.

Some old-fashioned hospitals "set up" with two table covers, one loosely thrown above the other, and these are peeled off in turn as the cases proceed. Heaven help the last case! But a pathologic expert can at once disprove the need of this, and its very clumsiness makes it dangerous. Others wind table legs with towels so as to

have safe access to a lower shelf. Rather convert this time, material, and energy into buying another table. Keep all work and materials on a level with the patient. Do not buy tables with lower shelves.

It is a grave error to allow any or all of the working force to have access to a table of sterile supplies. If there is a large number of pupils in the school, a hospital may afford one, as clean nurse, to stand at the sterile table (rigidly aloof from all workers or patients), who may *drop* on the work tables, *without contact*, what is needed for the case in progress. But she must touch nothing only her own tableful of goods.

Otherwise, when there is no clean nurse there is an absolutely clean start made for the second case. Each patient must have all the advantages that the hospital can afford. We call a case "clean" where we hope for primary union, yet in his blood may be we know not what —typhoid, tuberculosis, or lues. Therefore there must be rigid watchfulness to keep all separate.

For, suppose at the beginning of a long morning's work we have provided a table of sterile goods without a clean nurse stationed at it, observe what happens. The scrubbed nurse is not clean the moment after the first blood is drawn. She then goes to the table and selects some sponges. After the surgeon has finished the vaginal work, he, in his blood-spattered gown, leans over the table to get a second pair of gloves for the abdominal work. The scrubbed nurse returns to get some abdominal wipes, passing her gloves over the area touched by his gown. A smudge of blue chalk on his gown during the vaginal work can thus be easily transmitted to her sponges for the abdominal work or to a second case. Of course, pathogenic organisms, growing and virulent, are more easily passed along. Surgeons select the cleanest case first, but we never know what incipient diseases their anatomy contains. There are only two alternatives—a clean nurse at the supply table or laying out open only what is needed for each case, the extras to be

brought by the unscrubbed "floater." In a gynecologic hospital the dangers are worse, though less apparent, in the form of venereal disease and cancer.

Where a clean nurse can be afforded, she is all ready to wait on the surgeons for the second case, and can take instruments also for it, if so it is decided, so that the first instrument nurse can scrub and take her place on the supply table, then being ready for instruments on the third case.

All the apparatus directly concerned with the patient's inhalation of anesthetics should be boiled each time it is used, since some of the most dangerous germs of lues and tuberculosis are transmitted by mouth, as well as tonsillitis, la grippe, and others more speedily terminated but more prostrating and annoying, especially through the dangers from coughing, inducing hernia, and undoing the surgeon's work.

Some persons when they are scrubbed act as if they were sterile; nay, more, as if they were themselves germicidal, that if a germ lit on them they would blast it with instantaneous death. That they care for the patient well is true, but it is sadly equally true that they *can* carry infection from that patient to the supplies needed for another. There are two kinds of caution to take during the progress of an operation: (1) Do not come in contact with anything that will harm the present patient; (2) do not carry anything away from this patient to another.

How to Handle Goods from a Jar.—When rubber tubing, packing, or any other goods are needed that are kept in sterile jars *nothing that was used on the case* should be inserted into those receptacles. If a nurse is alone in setting-up and assisting the surgeon she must lay out all she thinks he will need before he comes, inserting into the jars a long forceps kept in lysol or alcohol, as the case may be abdominal or eye, and not be stingy about it either, for it is much easier to resterilize packing than to make a large lot for a drainage case thus caused. It is extravagant to resterilize more often than necessary, both

in time, gas or steam, and deterioration of materials (rubber, rubber tissue, etc.), but there must not be a central meeting-place for the clean and the unclean in

Fig. 18.—Pouring out drugs, holding the cork in an aseptic manner.

"sterile" supply jars. This long forceps, kept scrubbed with Bon Ami every day and dried out at night to prevent rusting, takes the place of a *clean nurse*. Lysol

(2 per cent.) is strong enough to render them germ free, but should not be carried into an eye solution. Rinsing in sterile water is necessary. If jar lids *must* be laid down, the sterile side is left uppermost so as to touch no unclean thing (Fig. 18).

A dram of any drug to a pint of water makes a 1 per cent. solution. But why is this? To know why means that one never forgets this rule:

1 per cent. means $\frac{1}{100}$.

In 1 pint are 16 ounces, or 128 drams.

$\frac{1}{100}$ of a pint = $\frac{1}{100}$ of 128 drams, or $1\frac{28}{100}$ drams.

$\frac{28}{100}$, about $\frac{1}{4}$, is a sufficiently small fraction to be disregarded in small solutions, the pathologists say. In making up solutions, the amount should always be calculated on paper and submitted to the supervisor for her O. K. Women ordinarily have very little mathematical ability, and if the nurse can be made to feel the dangers of a mistake and a doubtfulness of her own arithmetical powers, much will be avoided that is shameful and unpleasant. All the containers in the operating room should be measured with graduates—ounce, pint, or gallon—often enough to know at once the contents of any ordinary vessel by the eye, and then in working a graduate should always be used.

In setting-up for operations, too, the old rule must be observed thoughtfully, not with one's mind on the play or the dance of the night before—"Read the label three times." What was the nurse thinking about who filled the bichlorid arm-tank for an obstetrician with pure carbolic acid? Nobody can estimate the loss it caused to the physician, to the patient in labor, to the nurse herself, to the women of his private practice, hoping for the advantages of his own personality, so strong in obstetric work, when it came their turn. The institution loses in prestige, all by one *moment's* lapse on the part of the nurse, who could not have done it if she had been early forced into a groove of thoughtful habit.

To put a bell on poison bottles, or to stick a long pin

through their cork, acts as a good warning to nurses who do not keep their mind on their work.

Dusting.—Care must be regularly taken with the high dusting first thing in the morning, so that no foreign body can fall into the wound from the fixtures. Owing to the laws of physics governing air, heat, dust, etc., it is difficult to believe that any area over an operating-table is clean, but the nurse must prepare the overhead space perfectly, so as not to make her other work useless, instead of shunning it and leaving it to the orderly.

Orderlies.—Many times there will be a change of orderly, or days when none is to be had. The new ones must be thoroughly taught and watched afterward; this last without their being aware of it. It is not going to hurt any nurse to mount a solid stepladder or table and dust the chandeliers; but when an orderly is on duty it must be done to the same degree of perfection to the nurse's certain knowledge. The orderly is a very unpleasant factor at times in the working of a hospital, since it is a dependent, parasitic existence for an able-bodied young man in these days when the trades command such good pay and securities in the form of workmen's compensation. It is not safe to assume anything about an orderly's intelligence or conscience, and the nurse must see that his work is thorough. Yet there are a few simple, faithful souls who take a humble pride basking in the effulgence reflected from a great surgeon, working with zest to share in the results behind the scenes that ensure his brilliant successes.

It is very dangerous to the purity of the air to have vents in a glass dome roof or curtains sliding on a skylight to darken a room for the use of "scopes," or a ventilating fan near the ceiling, set in commotion during an operation. The scene must be all set before the case comes on as to air, light, and heat.

The **anesthetist** has been sometimes walled off from a view of the wound, but this has its disadvantages. The gain in asepsis is more than counterbalanced by his loss

of control when he cannot see how far his patient's abdomen is relaxed. Better discipline the one curious gazer who forgets his anesthetic in interest in the wound than deprive ten good anesthetists of their chief gauge of control. The anesthetic may be as fatal in its termination as the wound, and must have free play.

The anesthetist changes, with the other men, into a clean white suit and cap to save his own from odors and vomitus, as well as to exclude from the operating room all germs of the trolley car or pavement—*i. e.*, scarlet fever, tonsillitis, la grippe, etc.

Contaminated Instruments.—During an operation if any instrument becomes contaminated with pus it should be dropped, not on the floor, but into a floor basin, whence it is carefully taken to be washed and reboiled by the nurse. Towels that become thus contaminated are carefully drawn away from the wound, not flopped about, then rolled up, disinfected, and washed in the hopper, so that bacteria have no time to spread. It is very foolish to get all the towels and instruments smeared with pus in a dirty case. It can with a very little thoughtful care be mopped up, dammed up, and disinfected. This practically renders this case innocuous to all following it as to the general furnishings, the tables and tripods and irrigating stands not being smeared.

Breaks in Asepsis.—Everyone in the working staff should be on the "qui vive" for "breaks" in aseptic technic. Among surgeons the word "technic" means the method of incising, ligating, extirpating, etc., in classic operations—*i. e.*, the direction and length of the wound, the materials used, and the instruments required. But in nurses' slang the word "technic" means *their share* in the operating room in preserving asepsis. Instead of saying "break in technic" the phrase "break in asepsis" should be used. It is unfortunate that this confusion of terms has arisen. Let each one try to head it off. At any rate, all language should be clear, forcible, and uniform. A dressing cover is not a "skin" but a *dressing cover.*

What is a "probang"? What is a "whistle"? Each article should be named by its shape, material, and use. Yet so monotonous is routine that nurses fasten delightedly on the new language of the operating room and use it to the point of boredom.

The **operating-table** makes a lodgment for all the bacterial content of drainage, irrigations, and ordinary contact with dressings and towels. It requires thorough washing with soap and water and carbolic acid (5 per cent.) between cases, and a brisk whitening or polishing with Bon Ami each evening.

Floors are more satisfactory if white at all times. Between cases they are mopped, first with cold water to remove blood, then with clean water and soap, then with carbolic acid (1 : 40). This requires three different mops. The head nurse supervises the care of these mops with extreme vigilance, because not only is blood a first-class medium for germ culture, but where the operators wear street shoes instead of sneakers, or do not wear goloshes, millions of tetanus germs are carried in. These mops require washing and boiling, then sunning and airing. The unscrubbed nurse should be proud to wield a mop *during* the progress of a case—to prevent sloppiness and head off infection, to show that she has an interest in the case. A well-equipped suite has a hopper room with boilers for various utensils such as these. The white, small round peppermint lozenge tile finds most favor. It shows its cleanliness and is easily repaired.

The few **stands** and **cases** which the operating room holds must be thoroughly cleaned once a week, and always pulled out on their large, strong, noiseless casters to get at the walls behind. The instruments are boiled after each case before being laid on the shelves.

The **walls** collect dust, and require brushing every week and washing every three months. To disinfect the whole room by modern equipment there is a simple device controlled by the engineer from outside, by which, when the room has been sealed externally, live steam is turned on

and fills every corner, destroying every germ and spore better than any other known agent can do. Some hospitals permit the ghastly mistake of simply washing and drying instruments without boiling them before laying them away. This conveys many bacteria to the case shelves, where in the very humid atmosphere they multiply to the millions. One could reasonably expect primary union in an emergency operation if the instruments had been boiled when put away on shelves polished with alcohol a day or so before. There is no excuse for these errors if nurses would but use their brains and apply what they hear (but do not heed) in their lectures on bacteriology.

Shoes.—Some surgeons do, and all should, wear special shoes for operating-room work of a style and shape that will not induce fatigue. As nurses do not wear their hospital shoes on the street, they do not require special footgear for the operating room. But every nurse should keep on hand two pairs in good condition, however, so as to change in her time off for the purpose of relieving the feet of perspiration or heat and of airing the shoes in a sunny window. To secure efficiency in her staff a careful head nurse will watch and assume her authority in these points.

Health of Attendants.—It is imperative that each person taking part in the care of the operating room should be in perfect health. In one instance the men employees lived in the basement of the nurses' home, where the strong odor of burning calomel was observed for a whole evening, coming up from the room of the operating room orderly through the hot-air radiators which communicated with the nurses' rooms. He was treating himself for an attack of lues on a prescription from one of the interns in the hospital dispensary who had not deemed it necessary to report the affair "for fear the man would lose his job." Such orderlies should be given, on the slightest suspicion, a complete physical, not verbal, examination. Such interns should be suspended.

Emergency Cases.—If cases are brought off the street for immediate surgical relief, in those institutions which now so admirably meet the instant needs of their constituency, these sufferers can be cloaked by large gowns over all until after the operation. But there must be sincere and sympathetic co-operation between the office where operations are booked by the surgeons and the operating room. A case should not be rushed to the operating room as an emergency if it is not an emergency. But the operating room should always be instantly and cheerfully prepared and the work done, and if deceived a protest calmly entered afterward. There is no doubt that a woman capable of conducting an operating room has a sound, sane mind, and should have a reliable court of appeal to take her troubles to. If she does her work well, she is of more value to the hospital than any surgeon is who stoops to deceit. Careless diagnosis is just as culpable as deceit. The office or, in other words, the business superintendent must not expose all his patients to the dangers from overhaste with the one. He may be quite too anxious to cater to the whims of one attending or director, and overlook the axiom of "doing the greatest good to the greatest possible number," forcing irregularities on the operating room that may prove it a menace instead of a means for relief.

Contagious Cases.—Sometimes it is humane and imperative to admit a case of scarlet fever requiring an immediate mastoid operation from a home too poor to make the work possible. In such a case the city should provide special nurses if there are not enough pupils. An isolated room can be quickly fitted up as an operating room in a sanitary manner and the patient put to bed there after it is finished. Many towns are not well equipped for the care of contagion, and the philanthropists expect the hospital to meet all these exigencies. But the oldest nurse will emphatically state that when a humane act is performed in the midst of contagion harm seldom comes of it. But such conditions should be a potent argument

for building an isolation hospital. There should be a small, flexible committee to govern operating-room affairs, consisting of the less and the greater surgeons, the superintendent, the directress of nurses, and the operating-room supervisor. The directress of nurses is responsible for the health of her nurses and their work. If there is any "crooked work" in the operating room she cannot be compelled to provide nurses for that service, since the state does not specify this nor interrogate candidates for the degree of registered nurse on the problems of that service. She also can, through the operating-room supervisor, control any foreign nurses thrust in by a hostile superintendent. If, then, any steps have been taken through greed rather than altruism and humane feeling to put undue burdens on the operating room, rendering it unclean and slow in service for later cases, this committee can, by talking the matter over, adjust it and prevent a recurrence.

It is not proper to ask an operating room to sterilize supplies made in a home where contagion exists, nor the blankets, etc., used on a contagious case. Other means must be employed. This is a duty of the Board of Health. Every modern town should have public means of disinfecting anything. There is no emergency connected with the disinfecting of a mattress. Public aggregations of infection must not be brought to the hospital where people come trustingly to be operated on while weak and ill.

"Clean" Cases.—An emergency off the street is "clean" in the true sense of the word. A grimy coal-heaver with a broken leg is a clean case, where a dainty child with a ruptured appendix is a dirty case. The coal-heaver may have been inoculated with the tetanus germ off the ground, but the moment he comes in he is given a dose of tetanus antitoxin. But he must get absolutely sterile dressings, catgut never opened before, and newly sterilized towels, with gowns, caps, and all the "pomp and circumstance of war" against bacteria. Well cloaked, he is no menace to

the interior. But a woman with puerperal sepsis is a menace to everybody, and should not be treated in an operating room where eye work, bone-plating, and hernias are done, since her infection is powerful, insidious, and dangerous.

It is wise to have a small room with complete but modest equipment in which to segregate what are known to be septic cases, and to disinfect it with live steam whenever it is used.

Nurses Who are Ill.—Nurses with tonsillitis, la grippe, infected fingers, *et al.*, must be kept out of the operating room. Neither are the wards a safe place for them, since they are now, when ill, more susceptible to the infections of the patients. Where can they go? Off duty. Feed them properly and keep them well. House them comfortably, then watch their conduct. Inculcate the idea of dressing warmly around the neck and limbs so as to reach a healthy, graceful prime, and levy a heavy penalty for time lost by ill-health. The operating room owes the patient a duty and must not load him with additional disease.

Catgut is a fertile source of trouble, since it is an animal product. The equipment for making catgut is very expensive and the responsibility is very great. No amount of money can buy nurses in these days of women's rights, and equipment is always cheaper than human blood or brains. Buy the catgut from a reliable firm, and do not heap on the nurses a burden that has no connection at all with their work as private specials in the homes. The men who make catgut for the firms who deal in it have no other responsibility. They have no life-saving work to do; their hours are regular and they are trained for only one thing. But if catgut is made in a hospital, and a surgeon with a boil on his finger gets an infection in the hernia he has operated on, the vials of his wrath are unjustly let loose on the nurses. Some firms sell good catgut. Buy only from them. Do not change for lower prices. The supervisor must follow the cases and see

what is the effect with different kinds of catgut. It is a well-known fact that some penny-wise, pound-foolish hospitals have changed over to cheaper catgut, and have had a run of insidious, annoying, pride-reducing infections in what should have been primary union, not deeper, and, therefore, surely due to the catgut. This is rank robbery of the patient's time and money through lengthening his stay. The operators have an uneasy feeling as well as their colleagues outside who send the cases in.

Gloves and **towels with holes** are not only no good, but harmful. All holes must be mended. Tapes and buttons are sewed on gowns in order to fasten perfectly, since sloppy gowns trail over everything. If a surgeon finds that he has slit or pierced his glove during a case he must change it at once; otherwise it lets out into the wound all the poisons excreted in his perspiration and collecting there for one-half hour in a warm moist bed for bacteria. Perspiration itself acts as a foreign poisonous body also. Each nurse should become an expert in mending gloves smoothly and solidly. A package of sterile powder is done up inside of each glove case. They are opened by the dirty nurse in such a way that she does not touch the part whence the surgeon withdraws the glove (see Fig. 1). They may also be opened while "setting-up" and laid on the table beside the instruments, from which the surgeon must not take them with his bare fingers. The instrument nurse hands them to him. Dry sterilization is much more speedy and comfortable for the surgeon, but it runs the bills up because it ruins rubber. Boiling the gloves, or "wet technic," is much cheaper and, like many other things, more uncomfortable. The surgeon first takes the powder out, dusts it over his fingers, then pulls on the dry gloves by their inside surface, the wrists being folded back.

A strict technic must be observed with **bottles, jars,** and **shakers,** which can only be perfected by constant criticism and practice. A solution of cocain or adrenalin must not be heated, but it can be kept sufficiently clean

to be harmless with a little care. The cork can be held in the little finger of the left hand while pouring. The top side of a shaker should not be laid down. A jar lid is laid down upside down. When preparing to shake aristol over a raw wound wet a towel in bichlorid, and, winding it around bottle and wrist so as to cover any dust on their surfaces, shake gently over the bleeding area.

Sterile goods must not be carried under the armpit on account of perspiration, any more than we want a maid to run with bread from the baker's under her arm.

Tap-water is quite clean enough for the bichlorid tank, since the drug kills all the bacteria in the water easily. It takes a big load off the water sterilizers to know this. Furthermore, economy can be exercised in using 70 per cent. alcohol, which is just as effective as 95 per cent., and less costly by about one-fourth the price.

Every year marks an added simplicity in operating technic; for instance, comparing the slops of ten years ago—big wet abdominal dressings, irrigations, and douches—with the present dry method—no irrigation, no cleansing with green soap, merely painting a little iodin over the crusts around a cut. The results continue to improve, and each worker in this field should observe much, compare all, and contribute any original idea she has for the common good.

CHAPTER X

FORMULÆ AND DIRECTIONS

Thiersch's Solution.—A valuable antiseptic for nose and throat:

Salicylic acid	2 parts.
Boracic acid crystals	12 parts.
Water	1000 parts.

Carrel-Dakin Antiseptic.—Dissolve 140 gm. of anhydrous sodium carbonate in 10 liters of water. Add 200 gm. of chlorinated lime. Shake the mixture thoroughly, and after one-half hour siphon off the supernatant fluid from the precipitate of calcium carbonate. Filter this fluid through cotton. Make the clear fluid neutral or acid by adding boric acid, drop by drop, until a drop of the solution does not redden a few drops of phenolphthalein solution. Usually this requires 25 to 40 gm. boric acid.[1]

Iodoform Packing (I).—

Iodoform powder	15 c.c.
Normal saline	120 c.c.
Carbolic acid solution (5 per cent.)	℥j.
Tincture green soap	℥ss.
Glycerin	℥ss.

Sterilize in open jars for twenty minutes at 15 pounds; lids beside jars in the dressing sterilizer.

In making **iodoform gauze** the cloth will have been previously drawn, ravelled, or folded in odd half-hours in the anesthetic room, or by special nurses with leisure and willingness to help. Bandages are ravelled at the ends to leave smooth, threadless borders, because

[1] American Journal of Medicine, September, 1915.

threads in a granulating wound or a curetted uterus delay healing, acting as a foreign body. The fuzz is snipped off so that the remaining part will exactly measure, when spread out single, ½, 1 inch, or 2 inches, as labelled. The plain gauze is then sterilized once in muslin covers or in open jars in 12-inch to 5-yard strips for ears, uteri, etc.

The drugs of the formula are mixed with a sterile spatula in a sterile glass graduate, using a sterile minim glass to measure small amounts, then poured into a flat glass basin, also boiled. The powder is thoroughly emulsified in the green soap and glycerin before adding the watery solutions. No stain is left on glass.

The glass table is then "set up" with an opened package of towels, of packing, sterile brown glass jars, and the mixture. The nurse scrubs, lays a towel on the table, brings her materials upon it, and begins folding the gauze in plaits until it absorbs the mixture in all parts. Then she squeezes out all she can and lays the pieces in the jars.

Iodoform Packing (II).—

Iodoform powder	℥v.
Glycerin	℥j.
Bichlorid of mercury solution (1 : 1000)	℥v.

Sterilize in test-tubes with a cotton plug and a muslin cover for twenty minutes at 15 pounds in the dressing sterilizer.

Preparation of Catgut.[1]—Plain catgut is used in tissues which absorb very rapidly and where the strength of the union will not have any strain.

To *iodize catgut* increases its tensile strength. Chromicized catgut is hardened to a still greater degree than the plain and absorbs more slowly, therefore the line of union is much stronger because the patient's tissues do their own uniting. Chromic gut is due to be absorbed in the time mentioned on the label, as ten, twenty, or forty days. The union of tissue sutured with ten-day is usually satisfactory, the others being used for ligatures. In a

[1] See Dr. Brickner's comprehensive work, "The Surgical Assistant."

perineum after laceration by childbirth great strain is felt at each stool, therefore *chromic gut* is used.

Kangaroo tendon is always chromicized and is very strong. It is used to suture bone—*e. g.*, a fractured patella—in place of the old silver wire; also aponeuroses or ligaments, as in inguinal and femoral hernia. These various kinds of gut are bought in chloroform in tubes, boiled before using.

Horsehair acts like silkworm-gut. It is boiled before using and keeps in alcohol. Horsehair sutures are to be removed.

Silkworm-gut may be boiled as used and carried dry in a physician's kit, or boiled and kept in alcohol in an operating room. It is used in scalp wounds, in a mastoid, and in perineorrhaphy. It is of two colors, white and black, white showing up well in negroes, and *vice versa*. The black should be iron-dyed to secure a fast color.

Surgeons' silk should be threaded in 15-inch lengths in all grades of strength on all needles suitable for wounds requiring silk, and then run through a hemmed square of white flannel, afterward dry sterilized, but not too often, since the dry method rots the silk more than boiling. But this saves the trouble of threading during an operation.

Bone-wax is boiled for ten minutes, then poured into a second sterile dish, cooled, covered, and wrapped in a sterile towel to be carried about. It is so rarely used in a general operating room that the surgeon needing it should bring it.

Aluminum Acetate Solution.—

Plumbi acetate	3.5
Alumen	9.0
Aqua	ad 100.0

Mix and filter.

Dilute when using with five to eight times as much water. *Never use it full strength.* It macerates the skin and its ingredients are costly. Gauze is moistened, then

laid loosely on the part, then the limb is *laid on* a rubber sheet and covered with a high cradle to let air circulate and evaporation take place, which causes reduction of temperature. Do not wrap up in rubber.

Boric Acid Solution.—

Boric acid (crystals preferably)..... 4 parts.
Water.....100 parts.
Boil until clear. To use, add an equal amount of sterile water.

Pharmacists employ the cold process by adding the powder to cold water and letting it stand and absorb until a sediment remains (supersaturated).

Normal Saline.—Salt exists in the blood in the proportion of 9 parts to 1000, or $\frac{9}{10}$ per cent. It is not necessary to say $\frac{9}{10}$ of 1 per cent.—it is a reflection on the intelligence of the listener.

Normal saline is a solution which contains as much salt as blood does, and it is used to take the place of blood after hemorrhage or to stimulate after shock until, by taking food, the patient can manufacture new blood. In 1 quart are 32 ounces, or 256 drams, or 15,360 grains; $\frac{9}{10}$ per cent. of 1 quart = $\frac{9}{10}$ of $\frac{1}{100}$ of 15,360 grains = 138 grains. In 1 quart of blood are 138 grains of salt, therefore to make 1 quart of normal saline we add 138 grains of salt to 1 quart of water and boil it for five minutes to dissolve thoroughly. Filter now when cooled through sterile cotton and sterile filter-paper, regularly plaited to fit into a funnel that has been boiled, into a set of Florentine flasks of 1-pint, 1-quart, and 2-quart sizes. These have been cleansed with a bottle brush and tincture of green soap, sterile water, alcohol, and a final rinsing of sterile water, and stoppered with cotton plugs until ready for use. Or, dissolve the salt in the proper amount of distilled water, which if kept under aseptic conditions will minimize bacterial activity in the solution. Any and every hospital should have at least a simple distillation apparatus for use both in the pharmacy and the operating room.

In transferring saline solution to the flasks the nurse should "set up" a sterile table with sterilized cotton, gauze, tapes and utensils, and cleanse her hands as for operating. When the flasks are filled, only in the round part of the body, they are set on the floor of the dressing sterilizer and sterilized for one-half hour at 15 pounds for three days in succession, care being taken to mark them as being done once, twice, or thrice. If at any time crystals or cloudy spots are visible the solution should not be used. The brilliant clarity of well-made saline is always very noticeable.

Bichlorid of Mercury Solutions.—1 pint = 7680 grains. Pathologists have found that many of these powerful drugs have germicidal power at the strength of 1 part of the pure drug to 1000 parts of water.

$\frac{1}{1000}$ of 1 pint = $\frac{1}{1000}$ of 7680 grains = $7\frac{17}{25}$ grains, nearly $7\frac{1}{2}$ grains; therefore *any drug* dissolved in water in the proportion of $7\frac{1}{2}$ grains to 1 pint makes a 1 : 1000 solution.

1 : 2000 is much weaker. One man against two thousand foes stands a worse chance than one man against one thousand, twice as bad = half as favorable. To make a 1 : 2000 solution we therefore add 2 pints of water to $7\frac{1}{2}$ grains of the drug. Or, use one-half of the amount of drug to the pint of water. One-half of $7\frac{1}{2}$ = $\frac{1}{2}$ of $\frac{15}{2}$ = $\frac{15}{4}$ = $3\frac{3}{4}$ grains to 1 pint of water. But nurses must *never break tablets* to get smaller dosage. Dissolve $7\frac{1}{2}$ grains in as small an amount of water as possible and take one-half of it, then add 1 pint of water to make 1 : 2000 solution.

1 : 500 solution means more drug to 1 pint or less water to $7\frac{1}{2}$ grains, in the proportions of twice the amount of drug or one-half the amount of water, *i. e.*, 15 grains to 1 pint, or $7\frac{1}{2}$ grains to $\frac{1}{2}$ pint.

Where bichlorid of mercury is frequently used in weak solutions it is economic to keep a bottle of 1 : 1000 solution on hand, made up daily, for it deteriorates. We

then compute thus: For a vaginal irrigation we need 4 quarts of 1 : 6000 solution of bichlorid of mercury.

A solution 1 : 6000 is *five times weaker than* (= *six times as weak as*) a 1 : 1000 solution. One-sixth of the total amount is 1 : 1000 solution, the rest water. Our total is 4 quarts (4 × 32 = 128 ounces); $\frac{1}{6}$ of 128 ounces = $21\frac{1}{3}$ ounces. Take 21 ounces of 1 : 1000 solution and add to it 3 quarts 11 ounces of water for a total of 1 gallon.

It is very unsafe to keep strong solutions of mercury about. There may be undue haste in measuring them. Too strong bichlorid solutions act as an escharotic and corrode the flesh instantly.

Formaldehyd is a gas that is soluble in water in the proportion of formaldehyd 40 parts to water 100 parts. This solution is called formalin. Other fluids are sold, such as formacal, having the same ingredients, but not daring to use the original trade name, which has certain commercial rights and limitations. Specimens for the laboratory are almost universally kept in formalin. It does not shrink the delicate tissues of an eye. Alcohol does. Yet it preserves and hardens for section-cutting satisfactorily. Specimens must be placed in wide-mouthed bottles with good corks to prevent evaporation and concentration of the drug and consequent destruction of the tissue.

Formalin is 40 per cent. formaldehyd; 4 per cent. formalin for specimens means 4 parts out of the bottle labelled *formalin* and 96 parts of water. It does not matter how much formaldehyd is in this, but, to be definite, a 4 per cent. solution of formalin contains $\frac{4}{100}$ of $\frac{40}{100}$ of the amount of formaldehyd = $\frac{16}{1000}$, or 16 parts formaldehyd gas to 1000 parts of water. Use it sparingly. It is expensive and hard on the eyes and skin.

Nitrate of silver is best handled in tablets. They deliquesce when exposed to air and deteriorate if exposed to light, therefore must be kept in a dark blue or brown bottle tightly stoppered with glass and cotton. As the labels must contain a large amount of

necessary information, the print is consequently very fine and mistakes can easily occur. In one instance a nurse interpreted grs. 5 to mean gr. .5, or gr. $\frac{1}{2}$. She was distinctly wrong, because the *s* indicated more than 1 grain. But, being in doubt, she asked an intern who came from one of those states where, though there is not woman suffrage, the gentlemen always agree with the ladies, and he said grs. 5 meant gr. $\frac{1}{2}$. Therefore she made up a solution for bladder irrigation ten times as strong as it should have been, causing the patient great pain. Had it been a primary lesion he would have died, but being an old man with a very old infection he escaped. This saved her shoulders, but not her conscience.

Local Anesthetics.—*Argyrol, cocain, novocain,* and all similar drugs for eye and ear work or local anesthesia are prepared in most attractive and useful form by certain firms so as to be handled quickly and accurately, though nothing can be made fool-proof. The varied opinions about how long certain solutions are good render the tablet method the safest.

Cocain comes under the Harrison law in New York State, and the operating room must keep an accurate account of all it uses, just the same as any ward or any private physician.

These drugs must not be heated. Heat destroys certain properties or develops new ones, making them harmful to the patient. They are so carefully handled in the wholesale laboratories which are strictly conformed to the laws of hygiene that they need no sterilization.

One Per Cent. Solutions.—It is said that $4\frac{4}{5}$ grains to the ounce, to be accurate, or 5 grains to the ounce, roughly speaking, makes a 1 per cent. solution. Why is this? The nurses must know their tables of dry and liquid measure and work out on paper all percentage problems, to be shown to a supervisor. Arithmetic in its eighth grade forms should be made a rigid test for all nurses before admitting them to training. 1 ounce = 8 drams; 1 dram = 60 grains; 1 ounce = 8 × 60 grains = 480

grains. Roughly calculated, we call 1 ounce 500 grains. 1 per cent. means 1 per hundred, or $\frac{1}{100}$. $\frac{1}{100}$ of 480 grains = $4\frac{4}{5}$ grains.

Certain eye solutions are effective in the strength of 1 per cent., and from tablets marked so many grains we should make up the solution with distilled water in a sterile basin.

In making up solutions, find out how much is going to be used. Much extravagance is shown with drugs by making too large an amount of solution. This must be checked, so that nurses may not waste money in private families by foolishly ordering too much of any drug. Nurses should not dispense. It shakes the confidence of physicians and patients to see nurses with doubtful arithmetical ability working in the drug room.

The difference of $\frac{1}{5}$ grain ($5-4\frac{4}{5}$) makes a tremendous difference in the effect of some drugs, especially when a fairly large solution or a frequent use is desired. Pharmacists must never use the extra fifth. Their weights and measures are always uniform and accurate.

Rubber Tissue (Gutta-percha Tissue).—To *cleanse* and *sterilize* lay on a cold glass table, scrub with small brush, using tincture of green soap and cold water on each side, rinse under cold water tap, soak over night in bichlorid of mercury 1 : 500. Next day lift with sterile forceps into a sterile basin of water, then fold in dry sterile towels until dry, afterward sterilize in the dressing sterilizer for twenty minutes at 15 pounds' pressure, laying gauze strips between every two layers of tissue. Use a double muslin dressing cover. This is used mostly for cigarette drains. It does not stand frequent sterilization. The supply must not be allowed to get friable, since it is called for at critical junctures. A successful nurse is she who frequently goes over her whole stock of goods to see its condition. The date of sterilization for each gives an indication of its state. Rubber tissue should be put up without pins, merely folded deeply so as to stay closed. Mucilaged labels are very convenient and inexpensive

for such dressings. Flour paste is cheap and useful for labels, made by dissolving a teaspoonful of flour in one cup of cold water and boiling until clear.

Rubber Gloves.—Gloves must first be washed in cold water to remove K-Y, vaselin or blood; second, all the air squeezed out so that they stay under water, then wrapped in old muslin so as not to stick to the sides of the boiler above the water line, dropped into the boiler, and boiled for five minutes. The sterilizing room must have its own clock, on the wall behind the sterilizers, in plain view while they are being run. The gloves are lifted out, drained, tested for holes with cold water, and hung on the glove-tree to dry. The hospital carpenter can make a glove-tree, like a hat-tree, a pole on a tripod with prongs of wood the size of a clothes-pin and as nearly vertical as possible, on which the glove hangs by one finger. When dried on one side they are almost dry on the other, but are turned. Then they are sent to the workroom in two lots, those with holes and those without, to be mended with "pure gold" rubber cement. The holes are located by blowing up the glove and listening for the escape of air, wetting it slightly in a doubtful place to look for bubbles (Fig. 19). To blow up a glove, hold it taut by both sides of the wrist with forefingers and thumbs, twirling it over, and catching it all in at the wrist, pushing the air up into the digits. To mend, roughen the area around the hole with sandpaper or a nail file, cut the patch with round edge, apply and press firmly for a few moments with the warm hand, then lay in a press. Powdery gloves do not take the cement. If any portion of the glove dilates too much, mark it "poor" and keep in a class by itself. To powder the gloves, shake a large quantity of unperfumed talc powder in a gallon basin set on the work table, and station yourself on a high stool so as to have purchase when pressing downward, then pass the gloves, both sides, through the powder, squeezing them down on the unyielding basin. Fold the cuffs back until they only are wrist length (short), so that the scrubbed hands of the

surgeon, none too clean at best, surgically speaking, do not touch the outside when putting them on. Match the gloves for hands and sizes, then lay in their cases and envelopes, marked as to size, condition, whether perfect,

Fig. 19.—Detecting holes in a glove.

poor, or mended, and for any special surgeon, and "dry sterilize" for twenty minutes at 15 pounds.

One method of packing gloves for sterilizing includes in one dressing cover the glove cases for the chief operator

and his assistants. Another method is to put each glove case (one pair) in its own envelope, so that it may do for anyone who wears that size. The scrubbed nurse's gloves are done up for her separately. If many are put up in one bundle, and the chief's, for instance, are imperfect, a whole new set must be unsterilized. When a new operator or intern comes the nurses should at once register the exact size he wears, and it is very flattering to a surgeon to have the proper size handed to him, wet or dry, three months later when he again visits a new hospital. He will show his appreciation. To prevent inaccuracy about gloves the nurse who mends them should put them in covers and leave a signed slip inside each case. Put a small envelope of powder in with each pair of gloves.

Rubber Tubing.—This must be suited to the various wounds in length, lumen and firmness, or thickness of wall. Some pieces will be cut into a **T** and reversed in direction, therefore requiring a greater length. There must be a whole range of sizes in diameter, pliability, and length. If the surgeons at any time let drop a hint of what they may some day in the future want for special cases it is easy to keep it in stock. There should be no anxiety about it in the surgeon's mind. Rubber does not keep well after three months. Do not buy any with a disagreeable odor, made from old goloshes and automobile tires. Buy it as pure as possible, considering the firmness. When in reserve stock, unprepared, rubber should be in a cold place, dusted with lycopodium, which is blown out before washing and boiling. By wrapping all rubber in old muslin no scum from the water can collect on it in hard masses. Boil for ten minutes, then transfer with clean forceps into a clean boiled jar containing carbolic acid solution (5 per cent.). *Do not cut a catheter* to get a fine drainage-tube. *Have* the finest tubing as well as the largest.

Catheters, Filiforms, and Bougies.—These are kept until used in a cold place in lycopodium powder. There should be made by the hospital carpenter a large flat box

with lid and padlock, divided into compartments for each, so as to help in instantaneous selection or to review the stock as to number of each size. The nurse who has the care of these goods must be informed when one is taken out to be lent or used for some special purpose. A spindle in the workroom on the table (protected by a cork), or a bill-file high on the wall, will prove a good way to keep all such memoranda—"Retention catheter (mushroom), No. 14, sent to Ward B for Mrs. Mintz."

Rubber catheters should be washed in cold water with soap to remove any lubricant, then held under the cold tap and *milked*, as a cow's udder, to remove any solid particles inside, then boiled in old muslin, and hung up in a cool place to drain. Catheters must always be stretched to show if they have lost their resiliency. A catheter which is roughened or has any cuts or slashes around the eye *must not be used*. Catheters (rubber) for men and women should not be taken from the same place. To avoid this, use a female rubber catheter, 8 inches in length, made by at least one great hospital supply firm. The short length prevents its touching any unscrubbed part. The long male catheters get twisted and drop.

Silk catheters must not be boiled, bent, or carbolized. They are of woven silk, covered with shellac, and must be kept cool at all times. They are harmful to the urethral canal if roughened the slightest bit by causing abrasions and stricture. They must be washed with cold water and a mild soap, such as Castile or Ivory. All soap ends may be boiled down into a fluid paste for such purposes. The silk catheters are then drained, and may be hung in a small fumigating cabinet to dry. Such a cabinet, suitable for electric non-boilable apparatus, should be improvised at small cost; a box with a door sealed with "gumtite" or other gummed paper which, when the articles are required, can be turned with its door to the open window to drive off the fumes of formaldehyd from the candles used on the last occasion.

Fine cabinets for this purpose are made by the hospital supply companies.

Filiforms are treated like silk catheters. A carbolic solution which would disinfect would ruin their texture. Some filiforms are olive-tipped—some are as fine as a horsehair.

Bougies are solid catheters of waxed silk or catgut, chemically treated so as to be firm enough to create a passage or locate a stricture in the urethra.

Retention catheters are to be retained in the bladder, and are inserted from above in the course of the operation, or inserted at its conclusion, while the patient is yet relaxed, by means of an olive-pointed bougie or a large uterine probe. No force is employed, but much lubricant. Very slender uterine dressing-forceps have been used, but it is risky on account of the numerous folds of mucous membrane in the urethra, and only when the patient is under an anesthetic.

Preservation of Specimens.—When a section is cut out of a growth to be "frozen" and examined immediately before proceeding with the operation there is no time to waste in long journeys to a distant laboratory. Everything must be ready in the workroom, including the microscope: (1) A watery solution of formalin, 5 per cent., three to five minutes' immersion; (2) 50 per cent. alcohol, three minutes; (3) absolute alcohol, one minute; (4) wash off with water, stain, etc.

This is a speedy "combination freezing and fixation" method by Dr. Thomas Cullen of the Johns Hopkins Hospital. It is the nurse's duty to provide the stock materials and utensils, graduates of all sizes marked in the metric system, and a place where the pathologist has suitable light for his work.

Black Rubber Hard Goods.—These must be kept in cotton-lined boxes, so as not to chip or break. If roughened they would destroy the part where they are placed. They are cleansed by cold water, soap, bottle or tube brushes, and carbolic acid, 5 per cent. Black hard

rubber must not be boiled, or the shape, as of a tracheotomy tube, is ruined.

Silver Leaf.—This is bought in books, of silver interleaved with paper (Fig. 20). This book should be cut into sections, each containing five sheets of silver. Each booklet is then protected by two sheets of heavy cardboard, the whole being wrapped in a double muslin cover, pinned, and marked for sterilization for twenty minutes at 15 pounds. In a general way, all clean articles, such as silver leaf, which *cannot be boiled and are not used*

Fig. 20.—Silver foil.

again, are sterilized for twenty minutes at 15 pounds. It is a very lazy method to keep all the silver in one book, and, besides, it causes exposure to the infection from instruments used in a wound.

Care of Instruments.—After operations count each kind and classify into (1) Needles—straight, curved, etc.; (2) knives; (3) scissors; (4) blunt instruments.

Collect in separate basins, and if one is missing, *get it*—if the patient has to be reopened—*immediately*. Wash in cold water and prepare to boil as follows: (1) Fasten the needles in gauze with two bites each; (2) fold the knives

and scissors into old muslin, each in a layer by itself; (3) drop in the blunt instruments; (4) drop in the sharp-edged instruments according to the house rules of the Medical Board, or place in carbolic acid, then pure alcohol, for the time required; (5) add a handful of *washing soda* (sodium carbonate) when boiling instruments (*a*) to soften the water; (*b*) to raise the temperature and facilitate sterilization; (*c*) to prevent rust.

When boiled, lift out on the tray, drain, and prepare to polish. Use a thick pine board, 1½ by 1 ft. by 1 in., having a headpiece to work against and a place for brushes and Bon Ami. Superannuated tooth- and nail-brushes, well-boiled flat wide corks, pieces of gauze and flannelette are best for instruments in getting at the crevices and corrugations. This is the time to see whether they need renickelling. Wash off thoroughly in a lathery solution of tincture of green soap and at once transfer to a basin of alcohol. A pint of alcohol may be used over and over again in this way, being at other times tightly corked and definitely labelled. The corrugations, joints, and locks are well lubricated with vaselin after the instruments are thoroughly dried. Needles are threaded with suitable silk and run in flannel, scissors and other instruments laid systematically on the shelves, and knives laid in their boxes. Calcium chlorid in the cabinet absorbs moisture and camphor prevents oxygenation of the silver probes and catheters.

How to Care for Rubber Utensils (Soft).—Rubber aprons are soaked in bichlorid of mercury (1 : 1000) before operation. After operation they are scrubbed with cold water, brown soap, and a brush, rinsed with plain water, and painted with carbolic acid solution, 5 per cent., then dried over a bar and powdered. All flat rubber should be rolled on a roller under the edge of a counter or shelf; the roller of a window-shade can be adjusted for this. Rubber douche bags, seldom used now, can be boiled, and after using hung upside down to drain.

How to Prepare Sterile Adhesive.—Cut the strips the

desired length and width, roll on a wide-mouthed bottle (single thickness), and sterilize in the dressing sterilizer in a double muslin cover. When needed they may be easily loosened by pouring hot sterile water in the bottle, beginning first by tempering it with a little cold water.

To obtain a fine line of union without the possibility of stitch abscesses certain surgeons use adhesive edged with hooks and eyes. Sew the hooks and eyes on two strips of white 1-inch tape at the proper distances for a length of 8, 10, or 12 inches, to be slightly longer than the characteristic incision made by your surgeon. Cut sheets of adhesive the same length and 6 inches wide. Leave the crinoline on all but one side, where it is removed at a distance of 1 inch. Plaster the hooks and eyes on, tape down, into position, slightly turning in the edge of the adhesive. Face the bare inch surfaces with adhesive, its edge also turned in a little. Overcast the edge down among the hooks or eyes. Then remove the crinoline and plaster the two sheets side by side on a large brown gallon bottle. Do up in a double muslin cover and sterilize as above.

Ivory-handled Eye Knives.—These must not be boiled. They may be disinfected in benzine or formalin and rinsed, then wiped dry.

Needles with a Lumen or Bore.—All hollow needles for aspirating or hypodermic use, after being boiled, should be held in forceps over an *alcohol* flame. This dries without discoloration. Then insert the dry oiled stylet. Never put away a needle or trocar without its stylet.

Glass Syringes.—Ground-glass syringes are sterilized by boiling in separate parts. *After* they are boiled and cooled and *wet again*, insert the plunger in the barrel. They must be thoroughly washed before boiling.

Tracheotomy Tubes.—When a tracheotomy tube is *in situ* it is best cleaned by pheasants' feathers, which are firm yet flexible and pointed. They should always be on hand. The whole apparatus is covered with gauze moistened in soda bicarbonate solution.

Hospital Cold Cream.—For the anesthetic room some cream is needed for patients who fear the use of vaselin, etc.:

White wax	℥iv.
Spermaceti	℥iv.
Liquid petroleum (white mineral oil)	℥xxxij.
Sodii borate (borax)	℥ss.
Rosewater	℥xvj.

Melt the wax, spermaceti, and oil together at a very moderate heat. Dissolve the borax in the rosewater, then warm this solution and add it to the melted waxes and oil, and stir briskly until cool and creamy.

Hospital Hand Lotion.—

Powdered tragacanth	℥j.
Alcohol	℥ss.

Mix together and quickly add 1 pint of water and stir briskly.

Add 1 ounce of glycerin and 2 ounces of alcohol and add water to make 1 quart.

Perfume to suit.

To Sterilize Vaselin.—Sterile vaselin is prepared by setting the container in a water-bath and putting a dairy thermometer in the vaselin, raising it to 212° F., and keeping it at that point for an hour. The lid is boiled beside, but not on, the container. To obtain sterile vaselin from such a jar afterward dip in a sterile grooved director that has not been included on the instrument table. Do not put in the gloved finger. The grooved director may be then drawn over a sterile compress or applied to the glove. One can judge by the surface being intact that the vaselin is sterile This should be done daily in cases of constant catheterization, etc.

CHAPTER XI

THE METRIC SYSTEM. SOME BRIEF NOTES

LENGTH

The basis of the metric system is the unit of length. From it are worked out the units of the second and third dimensions, and of capacity and weight, by combining certain facts in physics, relating to temperature, or density at certain times. In order to have a distance that would be international and non-disputable, when changing their system of measures the French took for a unit that measure which is one ten-millionth of the distance between the equator and the North Pole, or 39.37 inches, a little longer than 1 yard, and called it a meter.

To get smaller units of length (one dimension) they divided the meter into 10, 100, etc., equal parts, using Latin prefixes to denote diminution:

Meter	=	39.37 inches (more than 1 yard).
Decimeter	=	3.937 inches (about $\frac{1}{4}$ foot).
Centimeter	=	.3937 inch (cm. = about $\frac{2}{5}$ inch).
Millimeter	=	.03937 inch (mm. = about $\frac{1}{25}$ inch).

To get larger units of length they increased the meter to 10, 100, etc., times its length, using Greek prefixes to denote multiplication:

Meter	=	39.37 inches.
Decameter	=	393.7 inches.
Hectometer	=	3937 inches.
Kilometer	=	39370 inches (about $\frac{2}{3}$ mile).

SQUARE MEASURE

Square measure is derived from this unit of length, the meter, since we multiply length by length to get *area*. If a plot of ground is 5 meters long and 4 meters wide it contains $5 \times 4 = 20$ square meters.

CUBIC MEASURE

Cubic measure for wood, loads of earth, etc., is also derived from this unit of length, the meter, since we multiply length by breadth by thickness (all being *distances* in meters, etc.) to get *volume* of earth and other materials for building, etc.

If a load of earth is 16 decimeters long (16 $\times$ $\frac{1}{4}$ foot = 4 feet) by 12 decimeters wide (12 $\times$ $\frac{1}{4}$ foot = 3 feet) by 8 decimeters deep (8 $\times$ $\frac{1}{4}$ foot = 2 feet), the whole load then contains 16 $\times$ 12 $\times$ 8 = 1536 cubic decimeters, or 4 feet $\times$ 3 feet $\times$ 2 feet = 24 cubic feet.

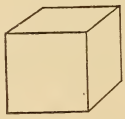
If 1 decimeter of length = about $\frac{1}{4}$ foot, then 1 cubic decimeter = $\frac{1}{4}$ foot length $\times$ $\frac{1}{4}$ foot breadth $\times$ $\frac{1}{4}$ foot depth (or thickness) = $\frac{1}{64}$ cubic foot. $\frac{1536}{64}$ = 24 cubic feet.

VOLUME

Volume is the measure for water and many other materials requiring a different kind of utensil. A *cubic* centimeter is a mass of water that has the following proportions:

Length.....1 centimeter (.3937 inch, or about $\frac{2}{5}$).
Width.....1 centimeter (.3937 inch, or about $\frac{2}{5}$).
Thickness.....1 centimeter (.3937 inch, or about $\frac{2}{5}$).

A cubic centimeter has three dimensions and is the same size in every direction, *appearing* as follows,



only *greatly reduced*, since each side would be only $\frac{2}{5}$ inch long.

The cubic centimeter has been taken as the unit or starting-point for measuring fluids, such as normal saline, blood, etc.

There are 1000 cubic centimeters in 1 quart, which corresponds to the French liter.

There are 500 cubic centimeters in 1 pint.

One pint = 16 ounces = 128 drams = 7680 minims.

$\frac{1}{500}$ of 7680 = about 15 minims.

One cubic centimeter = 15 minims approximately.

WEIGHT

In order to get a unit of weight the mathematicians then took 1 cubic centimeter of distilled water at 4° C., its thickest or densest period, and calling its weight (15 grains) 1 gram, made that the standard or starting-point for all substances that are weighed. They used the same Latin prefixes to denote diminution.

1 gram = 15 grains Troy, dry weight.
1 decigram = 1.5 grains Troy, dry weight, or $1\frac{1}{2}$ grs.
1 centigram = .15 grain Troy, dry weight, or $\frac{3}{20}$ gr.
1 milligram = .015 grain Troy, dry weight, or $\frac{3}{200}$ gr.

To denote increase or multiplication of weight Greek prefixes were used:

Decagram = 150 grains Troy, dry weight, about $\frac{5}{16}$ oz.
Hectogram = 1,500 grains Troy, dry weight, about $3\frac{1}{5}$ oz.
Kilogram = 15,000 grains Troy, dry weight, about 2 lbs.

1 pound = 16 ounces = 128 drams = 7680 grains.
2 pounds = 7680 × 2 = 15,360 grains.
$\frac{15{,}360}{1000}$ grs. = 15 grains approximately.

It is not absolutely true of all drugs, but *approximately* speaking, minims (wet) weigh as much as grains (dry), and that is the cause of the coincidence in the 15.

Substances Measured in

Minims.	Grains.
Saline.	Powders.
Oils.	Salt.
Blood.	Silver nitrate (solid).
Tincture of iodin.	Argyrol (dry, solid), etc.
Tincture of digitalis, etc.	

It may be of interest to note that the original meter is the distance between two lines on an actual platinum-iridium rod preserved in the archives of the International Metric Commission at Paris. Many European countries have adopted the metric system, thus facilitating all forms of international relations, but it is especially suited to the scientists, who thus have one common and delightfully systematic medium of communication.

CHAPTER XII

SPECIAL DRESSINGS

Mastoid Tips.—Gauze comes in 100-yard pieces in folds 1 yard square. In cutting dressings it is most economic to cut this large fold in the center, and then pick up each and open it out for 1-yard squares fluffed. But for small dressings, where we wish to keep the whole pile flat, layer upon layer for at least twenty thicknesses, we cut off the folded edges (ten) very sparingly, keeping the pieces to fill pads for perineal wear. Then the large square is cut in sixteen equal parts, four to each side. These small squares are now laid all on one pile and made into tips in the following manner:

(1) Pull one piece off the pile with the left hand.

(2) Catch it by the right forefinger and thumb in the very center and pull it through the left hand, which is closed over it.

(3) Lay it to the right in a pile, with the nose pointing away and the ragged ends nearer.

(4) When about a thousand are made, pick them up with the right hand, place the noses in an even row or cluster, turn, and trim off the ragged ends with one cut of large bandage scissors, leaving the tips 6 inches long.

(5) Put up in double muslin covers in bundles of thirty or so.

Mastoid Dressing.—Arrange for sterilization in the double muslin square covers and put in as follows:

(1) A square of blue tissue off cotton to keep fluff off the cover.

(2) A square of cotton 6 inches each way for an adult, then blue tissue, then another square of cotton.

(3) A piece of plain gauze packing, 9 inches long and $\frac{1}{2}$ inch wide (being perfectly sterile, not on the table).

(4) A gauze roller bandage of the finest quality, 2 inches, the sizing sets it when wet a little on the outside.

Gant Pad.—Used for hemorrhoidectomy or prolapsed rectum. Make the usual flat folded compresses, each one-fourth of the large gauze square yard. With all the raw edges turned in, these are $4\frac{1}{2}$ inches square, as measured up to the patterns cut or lined on the work-table. Take two compresses and cut each in half. Turning in that raw edge, fold the first half-piece in four equal layers, the second in five, the third in six. Roll the fourth in a tight, hard roll, keeping tight with a safety-pin temporarily in the center. Lay them in a pile one above the other, making a sort of pyramid or wedge. With two strips of adhesive, each 6 inches long and $\frac{1}{2}$ inch wide, wind the two ends of the pile tightly. This causes the bottom layer to lie flat and each one above it to bulge. When the whole is laid with its convex side against the anus, the flat side being pressed in by a binder, the bulging edge is made still more convex. By being well lubricated it forms a good dressing for a prolapsed rectum, being held in place with stout adhesive straps from buttock to buttock.

"Whistle," or Tampon Canula.—This prevents oozing of blood by pressure after hemorrhoidectomy, permits any considerable hemorrhage to show itself in the outer dressings, the painless escape of flatus, or introduction of enemata. Take a piece of stiff rubber tubing 3 inches long, smear with sterile vaselin, and wrap around with plain gauze, vaselin being rubbed into every turn of the cloth. Wind the gauze spirally at what will be the introduced or proximal end, so that it presents the form of a truncated cone. Slip a large safety-pin through the distal end so that it cannot entirely enter the rectum. Follow with split gauze compress pad and **T**-binder.

"Canule à Chemise" (Petticoated Tube).—The gauze is gathered about the end of a piece of rubber tubing, just like the cloth of an umbrella at the ferrule of an umbrella, hanging down from it loosely like the unbound umbrella.

The tight end is introduced into the rectum, the loose part acting as a drain or a fluffy pressure pad, all being well smeared with sterile vaselin.

Leg Rolls.—The selvedge must be *cut off* so as to produce a softly yielding spiral when applied. Cut off in one piece three thicknesses of the yard-square gauze. Fold over so that the selvedges come together and trim them off very sparingly, then cut in two, down the central fold, making thus two pieces ½ yard wide and 3 yards long. Open out, turn the ends in about 2 inches, fold *almost* to the center, and fold over, making a strip 4½ inches wide. Hold squarely on a solid table and roll very evenly. Do up in packages of two.

Tampons.—Required, lambs' wool or best grade of cotton, smooth stout cotton cord (knitting cotton No. 4), and the medications desired. Cut the cotton or wool in squares 4½ inches each way. Roll fairly snug and throw twice around the center or waist a doubled twine, working with the folded end of it. Pass the loose ends through the noose and tighten, then steep in the medication ordered. For a *very* young woman tampons may be made as follows: Cotton 1 inch square and only about ½ inch thick, wind with noose around the center, bring the ends together at the right and left to cover the cord, and trim until perfectly round and even, like balls of wool in fancy work used as round tassels. If not medicated, tampons should be lubricated.

Small Sponges.—*The Best Way.*—Cut the gauze in 9-inch squares by first trimming off the edges of the flat yard folds; second, cutting each side into four equal parts, sixteen to the whole square yard. Having all these 9-inch squares in one pile squarely in front of one, place the upper left-hand corner down on the lower right-hand corner, making a triangle. Place the left hand in anatomic position, palm upward, on the gauze and, enclosing the first *three fingers* in it, bring the two long points (of the fold) and the third remaining point down into the palm in a line with the fold in one big soft but secure twist. Secure it with the thumb and gently turn inside out.

Cloth Retractors.—These are intended to hold the soft parts out of the way during an amputation while the bone is actually sawed. A piece of stout unbleached muslin, 2 feet long and 1 foot wide, is torn lengthwise half-way into two or three tails, put up in a double cover, and sterilized. Two tails are proper for the humerus or femur, three tails (leaving the middle narrow tail for the interosseous space) in the forearm or leg (each of which has two bones).

Bandaging.—Every nurse should be able to apply any bandage with the edges turned in and to be handy with needle and thread when stitching it in position.

Making Packing.—Use the best gauze bandages. Sit with the right foot on a low stool. Turn in the end of the bandage, then turn each edge in toward the center. Then fold the two folds together so as to make the final strip *one-quarter* the original width. Roll the first few inches with both hands into a tape-like roll. Then pin securely as much as is finished. Then, holding the raw bandage in the left and the finished roll in the right, turn the edges in to the center, and again, together with a sawing motion over the knee, aided by the fingers of the left and applying traction with the right. Pin securely, after rolling up with the right steadily, every few inches. Two pins will do, alternating like cribbage pegs.

Eye Pads.—To prevent ether eyes cut a piece of gauze 8 inches square. Fold it on itself laterally. Leaving a space of $\frac{1}{2}$ inch in the center, bounded by vertical stitching, pad it to fill in the hollows of the eyes and nose, so that when it is laid on the face the eyes will be protected from any random drops.

Aristol Pledgets.—Take a very thin shred of the finest absorbent cotton and pick it until it is a circle $\frac{3}{4}$ inch in diameter, then gather all the edges in to the center and lay it on a smooth glass slab, rolling it with the ends of the second and third fingers, the palm facing downward, and, as when playing the piano, perfectly horizontal. With practice these can be rolled, like the opium-smoker's

"pills," into perfect balls. When a large number of this and gradually smaller sizes are rolled they are then stirred about in a square glass basin containing a couple of drams of aristol until they carry all they can. They are then sterilized in a jar.

Applicators.—(The soiled cotton on any applicator must always be removed by a bit of fresh cotton. Note!) The applicators must be rolled so that the part used can be easily removed. Take a thin shred of cotton about 1 inch square, of an even thickness, and, laying the end of a long (6-inch) double ear applicator (wooden) in the center of it roll the cotton trumpet shaped, fastening it with *moderate* firmness at the base. Wind both ends of wooden applicators, place in glass tubes (open at both ends), cover, and sterilize. With toothpick applicators the ends are so weak that about $\frac{1}{2}$ inch must always be broken off smoothly lest it break in the patient. The best toothpicks are of pine or cedar and are rather rough and square in the thickest part of their body; *not* the polished, rounded, fashionable café toothpick. The rougher surface holds the cotton. Take a very thin shred of finest absorbent, pick it to a square, fold it like a diaper once, then lay the point of the toothpick in the middle of it and roll, finishing by running the thumb-nail around the base. Then, to make it pretty and smooth, *revolve* it with the right hand, holding the cotton head between the tips of the thumb and second finger of the left hand, pressing down from above gently with the tip of the forefinger to polish and bevel it into the shape of a trumpet. These are thrown away after using, and being inserted into infants' ears or nostrils, the cotton must not come off.

Tape Stickers.—These must be made according to the drainage cases. For a back, use a piece of basswood splint, 9 inches long and 3 inches wide. Use the adhesive rolls; the cheaper way to buy it and suited to *all purposes*. Nick the end of the roll in 3-inch widths ready to tear, and tear the strips one at a time, *cutting* them off below.

Then carefully strip off the crinoline, of which part is to be used again. At one end fold down one corner squarely on itself, a little past the center (about $1\frac{3}{4}$ inches), then the other corner on top of it, making an even edge where they meet. This overlapping made by folding past the center gives three thicknesses to cut through for the tape. Now fold this point on itself, and in the center make a **V**-shaped nick all the way through. Then lay the strip on the basswood splint, gummy side to the wood, so that the ends are flush and they adhere for 4 inches. Fold back on itself and apply the crinoline to the remaining space as far as the double tip. Take now 9-inch lengths of $\frac{1}{2}$-inch white tape, make a nick or opening 1 inch from the end, running not *crosswise*, but with the *length* of the tape, slip the short end through the hole in the adhesive, then thread its long end through its own eye. Make a number, adhering thus in the first 4 inches of their length, crinolined in the center, folded, and threaded with tape, six to a splint.

How to make a **T**-binder in a hurry from a bandage of muslin: Cut off 1 yard of a 3-inch muslin bandage. Fold it crosswise by its length and slit it for $\frac{1}{2}$ inch, the cut running lengthwise with the cloth. Take a second piece 1 yard long and 3 inches from the end, fold it over lengthwise, slitting it crosswise for 1 inch. Thread this short bit through the cut in the middle of the waistband, the first, then thread the long remaining stem of the **T** (which goes between the thighs) through its own eye. For a male patient split this latter for $\frac{1}{2}$ yard up from the other end, the bottom of the **T**, to secure the dressings. This saves safety-pins.

Whether the supplies are made by probationers in a big supply-room or by the nurses of the operating room, they must be supervised by the head nurse of the operating room. This unifies the work of the house, and, in any event, the pupil finishing her operating-room service should know all there is to be known about making dressings.

CHAPTER XIII

TERMS USED IN SURGICAL DIAGNOSIS

The pupil is humanely curious about the cause for bringing each patient under the knife, and we should use, not neglect, to our own great advantage this most potent agent, indeed, for inducing many to "sign up" for three years' training, to get an insight into, not anatomy, but pathology, in which oddly enough no primer has been written yet for nurse training-schools. The pupil is entitled to know the diagnosis, if that has already been explicity made, before she attempts to "set up" for the operation. When it is all over, and the patient is ready for the ward, the unscrubbed nurse draws up a slip, attached to his chart temporarily, on which are blanks for the diagnosis, operation, stimulation, etc. (See chapter on Nomenclature.) She must, therefore, be familiar with the sound and the meaning of the terms required, so as to transmit them properly to her co-workers on the wards and so as to enable all to carry on their work more intelligently and happily. In the tense moments between two cases it is maddening for the supervisor to hear a dazed, "I beg your pardon. What did you say the diagnosis was?" or "How do you spell that?" But, again, it is very easy to peep at a text-book nearby in a moment's pause to look up a term one has just heard fall from the surgeon's lips, the image of the thing discussed now engraved forever on one's mind because the specimen is "right there" for observation. So closely are these terms of diagnosis connected with the minor outlying conditions that accompany the central disturbance, with the names of measures employed to remedy them, and with the specific term for the specific

operation, that the following list of definitions does not try to separate the three classes. All may be heard in one conversation and in a simple work of this kind it would be foolish to draw up a third dictionary, since it causes too much hurried fumbling. There are in the following text no terms not commonly used, but it is attempted to give a comprehensive list of all that will be used relating, not to what is *done* in the operating room (see chapter on Nomenclature), but relating to the conditions *preceding* and *necessitating* the operation.

Pathologic tissue means diseased tissue, in this instance to be treated surgically. It may be diseased by inflammation, benign or malignant tumors, cysts of a watery or purulent nature, malformations, transformations, congenital absences of parts and other deformities, besides those resulting from accidents and wounds. All terms ending in *itis* denote inflammation of the part named, as *cholecystitis*, inflammation of the gall-bladder.

TABLE OF TUMORS

Normal tissue.	Tumors found therein.
Fibrillar connective tissue	Fibroma singular, fibromata plural. Greek nouns ending in *oma* form plural by adding *ta*.
Mucous tissue	Myxoma.
Embryonic connective tissue	Sarcoma.
Endothelial tissue	Endothelioma.
Fat tissue	Lipoma.
Cartilage	Chondroma.
Bone	Osteoma.
Neuroglia	Glioma.
Muscle tissue type	Myoma.
Smooth muscle tissue	Leiomyoma.
Striated muscle tissue	Rhabdomyoma.
Nerve tissue	Neuroma.
Vascular tissue (veins and arteries)	Angioma.
Lymph vessels	Lymphangioma.
Glands	Adenoma.
Various forms of epithelial cells and associated tissues	Carcinoma.

CYSTS

Cysts are sacs filled with watery, purulent, or cheesy material, and are of two kinds: (I) Those developed from pre-existing cavities. (II) Those originating independently after pathologic changes.

Class I is formed by an accumulation in a gland or its excretory ducts of secretion (altered somewhat) when pressure or inflammation hinders normal discharges. This secretion is either mucous, sebaceous, or serous. To these belong the comedone, milium, ranula, chalazion, atheroma, milk cyst, ovarian cyst, cysts of fallopian tubes, of gall-ducts, the transudation cysts due to chronic inflammation in the lymph-spaces or serous sacs—namely, ganglia, hydrocele, and hematocele.

Class II is formed (1) by the softening and disintegration of tissue (*e. g.*, from old abscesses); (2) or by the formation of a wall around foreign bodies (parasites, masses of blood producing an inflammation and becoming encapsulated); (3) or by new growths in whose spaces various kinds of fluid accumulate, quite like glands, as adenomata on the ovaries, though they are called cystomata; (4) or congenital cysts, dermoid cysts of the ovary or of subcutaneous tissue (as the scalp), being probably part of another fetus.

GLOSSARY OF TERMS

A

Abortion. Expulsion of the contents of the pregnant uterus before the child is viable (end of sixth month).

(1) *Abdominal.* Escape of fertilized ovum into peritoneal cavity, where it attaches itself to the intestine.

(2) *Complete.* The sac comes away intact.

(3) *Criminal.* Procured artificially without being necessary from the legal standpoint of the patient's health.

(4) *Epidemic.* Arising from the presence of contagious disease.

(5) *Habitual.* Repeated, due to syphilis usually.

(6) *Incomplete.* When the membrane or placenta is retained.

(7) *Inevitable.* When the sac has ruptured and the fetus is about to appear.

(8) *Septic.* When the patient becomes infected through the introduction of bacteria or the decay of retained tissue.

(9) *Spontaneous.* Not induced by artificial means.

(10) *Therapeutic.* Induced to save the mother's life.

(11) *Threatened.* Appearance of symptoms which are checked by putting the patient to bed and giving her opiates. This usually can check an honest miscarriage in the early symptoms.

Abscess. A localized collection of pus surrounded by a wall of leukocytes.

Cold Abscess. Tuberculous, usually about a bone, joint, or gland—slight pain, no acute inflammation, very slow.

Psoas Abscess. Both *cold* and *psoas* are misnomers, generally low Pott's disease; pus from the spine runs along the psoas muscle pointing beneath Poupart's ligament. The psoas muscle runs from the lumbar vertebræ to the lesser trochanter of the femur. Poupart's ligament runs from the anterior superior spinous process of the ilium to the symphysis.

Adenoma. May become malignant, as sarcoma; many are benign, but some are most malignant—an epithelial tumor.

Amenorrhea. Abnormal absence of menstruation.

Aneurysm. A circumscribed dilation of the walls of an artery.

Angioma. A tumor formed of blood-vessels—benign.

Anomaly. An abnormal thing or occurrence, a marked departure from the normal.

Anteflexion. A bending forward or doubling on itself forward.

Antrum. A cavity or hollow space in a bone, as in

the mastoid, often infected; antrum of Highmore in the superior maxillary.

Appendicostomy. Opening the vermiform appendix at the tip and irrigating the colon downward for the purpose of eliminating the germs which make that their abode.

Appendix (vermiform). Small blind gut hanging from the cecum.

Ascites. Obstruction of portal circulation in chronic heart and kidney diseases causing a collection of fluid in the peritoneal cavity. To let off this transudate we "tap" or do a "paracentesis" with a trocar, which passes through without infecting the peritoneum, with aseptic precautions.

Asphyxia. Suffocation; lungs deprived of oxygen.

Atheroma. A sebaceous cyst containing cheesy material.

Atresia. Lack of normal opening; *e. g.*, to the vagina.

Atrophy. Diminution in the size of a tissue, organ, or part.

Atypic. Not resembling its type; irregular, freakish.

B

Bartholin's glands. Vulvovaginal glands whose tiny openings appear about at the center of the inner surface of the labia minora, a seat of venereal infection.

Benign, Benignant. Not endangering health or life.

Bile-duct. The haunt of the Bacillus coli communis, the typhoid germ, etc.

Boil. A furuncle; a localized inflammation of the skin and subcutaneous tissues with formation of pus.

Bone-grafting. A new field in surgery, dating from about 1911, where a healthy bone is planted to splint and support or take the place of an unhealthy one, the callus thrown out by the irritated bone forming union; *e. g.*, the tibia to the spine.

Bubo. Suppurative inflammation of a lymph-node, usually in the groin and usually venereal.

C

Cachexia. Depraved condition of general nutrition due to syphilis, tuberculosis, or carcinoma; weak, tough, yellow, muddy skin, and emaciation.

Calculus. Stones in the ureter, kidney, gall-duct, or bladder, sometimes causing occlusion of the ureters and consisting of uric acid, oxalate of lime, phosphates or cystin—a stone-like concretion inciting pyelonephritis—when in the gall-ducts, of bile pigment. See *Gall-stones.*

Capsule. A receptacle or bag; covering of certain organs; *e. g.*, the kidney, the liver, some cysts, and parts of the eye.

Carbuncle. Hard, circumscribed, deep-seated, painful, suppurative inflammation of subcutaneous tissue, larger than a boil, with a flat top and several points of suppuration.

Carcinoma. Malignant epithelial tumor prone to local extension through the lymph-spaces. It may appear at any age and may have inflammation, ulceration, and hemorrhage. It is more frequently found in some parts of the world than in others. The age limit is said to be *lower* now only because patients are handing themselves up sooner to physicians and the complex life of this time ages people faster. Epithelioma occurs in skin where it joins the mucous membrane on the lips, eyelids, labia, mouth, esophagus, vagina, or cervix. It may not recur if thoroughly removed, and is the least malignant of the carcinomata. Cylindric-celled carcinoma occurs in the stomach, intestine, and uterus. Carcinoma simplex occurs in the mammæ, stomach, liver, thyroid, salivary and prostate glands, in the pancreas, testicle, ovary, and kidney. Some of these are the most malignant. There has been no serum or toxin yet discovered as a cure, but early recognition and early radical operation save many lives.

Caries. Death of bone; similar to ulceration of soft tissues.

Caruncle. Small, fleshy growth, frequent in women, in the meatus urinarius.

Chalazion. A tumor of the eyelid from retained secretion of the meibomian glands.

Cholecystitis. Inflammation of the gall-bladder.

Cholelithiasis. Presence of stones in the gall-bladder or gall-duct composed of bile pigment, that is, cholesterin and certain salts. By lying together they become facetted, and may exist in as large numbers as 7800.

Cholesteatoma. Cells packed with cheesy matter, benign tumors in the dura behind the ear; found in mastoid operations.

Chondroma. Benign tumor of the covering of cartilage, but it may extend into the lungs or heart.

Cicatrix. A scar; connective tissue replacing a local loss of substance, the new being red or purple, the old white, hard, shrivelled, and shiny.

Circumcision. Removal of foreskin or prepuce for cleanliness and prevention of self-abuse.

Cirrhosis. Chronic inflammation of an organ and overgrowth of connective tissue.

Clitoris. A very small organ in the female in front of the pubic joint, somewhat resembling the penis in the male, and extirpated to check self-abuse.

Colic. *Biliary.* Passage of gall-stones through the gall-duct into the duodenum.

Renal. Pain caused by stone in the ureter.

Appendiceal. Pain and rigidity of spasms due to inflammation.

Intestinal. Severe griping pain in the bowels due to spasm of the intestinal walls.

Comedo (sing.), **Comedones** (pl.). Disorder of the sebaceous glands; in the young, yellowish elevations with black points in the center associated with acne.

Condyloma. A wart-like growth or tumor near the anus.

Congenital. Existing at and since birth.

Convergent. Coming together, as in squint.

Cornu (sing.), **Cornua**—*horns* (pl.). The projecting upper corners of the uterus into which open the Fallopian tubes.

Cul de sac of Douglas. A pouch between the front wall of the rectum and the back wall of the uterus made by the peritoneum.

Curettage. Curetment—scraping out the uterus. It is essential for the honor of the hospital to have a true history.

Cyst. A cavity containing fluid and surrounded by a capsule.

Cystocele. Hernia of the bladder. The back wall of the bladder drops down, pushing out the front wall of the vagina, the weight of urine increases this, and finally may pull down the cervix and the uterus.

D

Decapsulation. Taking off the capsule of a diseased organ to establish new circulation and reduce inflammation, as of the kidney, for nephritis or bichlorid poisoning.

Dermoid cyst. A sac containing hair, teeth, nails, and other forms of epithelial tissue.

Detritus. Waste matter from disorganization.

Dilation. As correct as *dilatation*—act of stretching.

Distal. Farther away from the point mentioned.

Divergent. Going apart, as in squint.

Diverticulum (of bladder or esophagus). A pouch or sac springing from a weakness in the wall of a main structure, causing the contents to stop there which should pass on; symptom of diverticulum of esophagus in an adult, regurgitation of food just as sweet as when swallowed.

Dorsum. The back of the hand, foot, tongue, etc.

Dura mater. Membrane covering the concave surface of the skull, "exposed" in ear operations under strict aseptic precautions, "going in" from outside, or the outermost of the three coverings of the brain.

Dysmenorrhea. Painful menstruation.

E

Ecchymosis.—Large diffuse accumulation of blood in the interstices of the tissues.

Ectropion. A disease of the eyelid turning it inside out.

Effusion. A pouring out of blood or serum into serous cavities (pleura, peritoneum, pericardium).

Embolism. Blocking of a blood-vessel, especially an artery, by foreign matter.

Embryonic. Pertaining to the embryo, or fertilized ovum of an animal.

Encapsulated. Surrounded by a capsule, as a bullet or any other foreign body.

Endometritis. Inflammation of the lining of the uterus, with swelling, congestion, and even hemorrhages.

Endothelioma. A sarcoma in the lymphatics.

Endothelium. Lining of blood- and lymph-vessels and of serous and synovial cavities.

Entropion. A disease of the eyelid turning it outside in, so that the lashes constantly scratch the eyeball.

Epididymitis. (Note spelling.) Inflammation of epididymis, small organ lying above the testes.

Epispadias. Opening of urethra, not at the end, but on the upper side of the penis, due to arrested development.

Epithelioma. Carcinoma of the skin and mucous membranes.

Exostosis. Bony tumor; an abnormal projection of bone.

Extra-uterine pregnancy. Gestation outside the uterus, in the tube, fimbriæ, peritoneum, or on the intestines.

Extravasation. Passing of fluid outside of a cavity in which it normally ought to stay (of blood or lymph).

Exudate. The material that has passed through the walls of vessels into the adjacent tissues (said of serum or pus).

F

Felon. Inflammation of flexor tendons and tendinous sheaths of the finger. See *Paronychia, Whitlow.*

Fenestrated. Having a window or opening, as in a rubber drainage-tube, a pair of obstetric forceps, or a plaster cast over a sinus.

Fibrin. Coagulating material in blood; small bunches of twigs are used to whip clots to separate the fibrin in looking for fetal or placental tissue.

Fibroma. A tumor, benign at first, in skin and subcutaneous tissue may become serious through pressure, ulceration, etc.

Fissure. A groove or cleft (normal) in the skull, brain, liver, cord, etc.; an abnormal fissure occurs at the junction of skin and mucous membrane, as the lips or the anus.

Fistula (sing.), **Fistulæ** (pl.), **Fistulous** (adj.). A narrow, winding, irregular canal in the soft tissues left by incomplete healing of an abscess or wound with fluid contents; must be entirely laid open and the edges bevelled off so as not to approach again (usually rectal).

Flap. A piece of soft tissue cut on three sides of a square and laid back to cover a scar, or to bring forward after an amputation to cover a bone end.

Floating. Free to move around; abnormal, as a kidney, which has no ligaments at all to hold it up, merely fat.

Fossa. A depression or pit.

Frenum. A rib or fold of skin or mucous membrane that limits the movement of any organ. Under a newborn infant's tongue an abnormal frenum should be promptly snipped or it cannot nurse and will be tongue-tied.

Frontal sinus. Hollow air-spaces in the frontal bone; a seat of infection that becomes fatal at times through the easy way of reaching the brain; operated through the nose.

Furuncle. A boil.

Furunculosis. The constant formation of a succession of boils.

G

Gangrene. Death of a considerable mass of tissue. When it is mummified, dry and hard, brown or black it is classified as *dry gangrene;* when discolored and putrefying, *moist gangrene.* It proceeds from wounds, diabetes, and other causes. It is not a cause for panic now, as formerly, in hospital wards.

Glaucoma. Disease of the eye, with heightened tension, hardness of globe, lessening of visual power, restriction in field of vision, dreadful headache, etc.; relieved by iridectomy.

Glioma. Tumor of neuroglia cells in the brain, cord, retina, nerves, and suprarenals; benign.

Granulations. Formation of new vascular but nerveless tissue in repair of wounds.

Gumma. Third stage of syphilis in the brain. Should take precautions against contagion. It is a tumor with a gummy appearance, consisting of granulations and showing peculiar degeneration.

H

Hematocele. Blood extravasated into a closed cavity.

Hematoma. Collection of blood in a tumor-like mass on a newborn infant's "caput," be it the head or buttocks.

Hemophilia. All words with the prefix *hem* (for blood) as their root should be spelled *hem* uniformly. Hemorrhagic diathesis, condition of being a bleeder. Important question to ask in taking a history. When circumcising a newborn infant he proved a bleeder, and after all other means failed, a large number of the tiniest clamps ever made, covering the whole wound, saved his life.

Hermaphrodite. A human being whose organs are so malformed as to partake of the nature of both sexes.

Hydatid mole (*hydatídiform*). Hypertrophy of the villi of the chorion, beginning as a fibrous mole; then its mucous membrane degenerates, then a hydatid mole.

Hydrocele. Accumulation of fluid (serous) in the tunica vaginalis about the testicle or the spermatic cord.

Hydrocephalus (the noun, note ending *us*). A head containing a collection of fluid in the cerebral ventricles, with steady increase in size.

Hydrosalpinx. Fallopian tube dilated with water into the shape of a cyst.

Hymen. A fold of mucous membrane partially closing the virginal vaginal opening.

Hypospadias. The male urethral opening into a cleft on the under side (arrested development).

Hypostasis. The settling of blood in the dependent or low-lying parts of the body.

I

Ileus (volvulus). A twisting of the bowel so as to obstruct the passage of air, feces, or fluid; usually fatal.

Impaction. A mass of fecal matter or calculi solidly packed; stones in the cystic duct cause dilation of the gall-bladder; very large stones sometimes cause occlusion of the gut.

Imperforate. Without a normal opening, as of the anus (a hole from the rectum often leads to the vagina instead).

Incarcerated. Walled in and bound around, as a hernia in a sac.

Infarction. A circumscribed portion of tissue completely infiltrated with blood.

Infiltration. The entrance into the tissues (1) of some abnormal substance or (2) of some normal substance (as blood) in too great a quantity.

Inflammation. Heat, swelling, redness, pain, and impairment of function; a rush of leukocytes to fight the invasion of bacteria.

In situ. In the natural position.

In statu quo. In the natural condition.

Intercostal spaces. The muscular areas between the ribs, numbered.

Intussusception. Slipping of one part of the intestine into the part beyond; telescoping of the bowel on itself, as the ileum into the colon.

Invagination. Act of insheathing or being run into a sheath, as inverting the raw end of the appendix stump inside itself.

K

Keloid. An overgrowth of tissue standing out like a very full frill, usually in any old scar, and very common in the negro race.

Kidneys. Subject to inflammation, have no supporting ligaments, malformations quite common, as two in one or one missing, or one with two ureters, have tumors of various kinds; the healthy one should not be removed by mistake, this being the result of carelessness in marking specimens obtained after catheterizing the ureters.

L

Laceration. A tear, especially of the cervix or perineum in childbirth; repair is imperative.

Lamina. Plates or layers applied to vertebræ.

Laminectomy. Removal of the posterior arches of the vertebræ.

Lateral. Belonging to the side; in a sideways direction.

Leiomyoma. Benign tumor of involuntary muscle.

Lesion. An injury, a wound, or any diseased morbid condition in an organ.

Leukocytes. White corpuscles.

Leukorrhea. Whitish mucopurulent discharge from the female genital canal.

Lipoma. Benign, fatty tumor.

Lobe. A rounded part of an organ, separated from the others by fissures or clefts.

Longitudinal. Lengthwise; in the longest direction of the body.

Lymphangioma. Benign but may rupture; a tumor made of lymphatic vessels.

M

Malformation. An abnormal development or formation of a part of the body.

Malignant. Applied to tumors; harmful, fatal. Known if (1) they spread by metastases; (2) they invade adjacent material by eccentric or peripheral growth; (3) they tend to recur; (4) they interfere with the nutrition and general well-being of the body, inducing cachexia.

Malposition. An abnormal position of any part or organ.

Mastitis. In infants streptococcic or staphylococcic infection. Use no pressure, no massage. Inflammation of the breasts found in nursing mothers.

Mastoiditis. Inflammation of mastoid cells behind the ear.

Do not confuse these two terms.

Median line. A line in the center of the body from the umbilicus to the symphysis pubis; imaginary.

Menorrhagia. Excessive menstrual flow.

Metastasis (sing.), **Metastases** (pl.). Transfer of diseased particles by the blood or lymph from the primary bed to a distant one.

Metrorrhagia. Uterine hemorrhage; *not* connected with the menses or childbirth.

Microcephalon. An abnormally small head.

Milium. Small, pearly, non-inflammatory elevations on the skin due to plugging of sebaceous glands.

Mole. Birthmark; a pigmented nevus.

Mouse-tooth. Forceps with sharp teeth like a mouse's. Do not be guilty of saying "mouth-tooth."

Multilocular. Having many cysts or "eyes"—middle (*l*) put in for ease in pronouncing.

Multiple. Affecting many parts at the same time.

Myoma. Benign muscular tumor, frequent in the uterus.

Myxoma. A benign growth in connective tissue, but may recur; containing *mucin*, like Wharton's jelly in the umbilical cord.

N

Nævus or **Nevus.** Vascular birthmark; "strawberry mark"; an angioma full of blood-vessels, benign and congenital, corrected by skin-grafting.

Necrosis. Death of a limited portion of tissue due to insufficient nutrition by (1) cutting off the blood-supply; (2) bacteria; (3) mechanical injury.

Neuroglia. Has its origin in nervous tissue, but takes on the duties of connective tissue.

Neuroma. Benign tumor; new formed nerve tissue.

Node. A knob, swelling, or protuberance; the normal shape of many lymph-vessels.

Nodule. A little node.

Noma. Not surgical. An ulcer in the cheek rapidly spreading down the alimentary canal.

O

Obliteration. Removal or disappearance of a part.

Obstruction. Blocking of the blood or the bowel.

Occlusion. Closing or blocking off, as of the Fallopian tubes, inducing sterility; or of the gall-duct with gall-stones.

Œdema or **Edema.** Infiltration of serum into a part.

Omentum. Useful for absorption and its fat supply; a fold of peritoneum hanging down like an apron in front of the intestines.

Oöphoritis. Note spelling, marking, and pronunciation, not like *oo* in *foot*, but like *oa* in *oasis*. An inflam-

mation of the ovary after the puerperium, or it may be a primary affection.

Orchitis. Inflammation of the testicle.

Organized clot. Found in curettings; blood converted into something looking like an organ or other living tissue. When curettings are examined they should be whipped with a bunch of twigs to separate the fibrin so as not to miss a tiny fetus.

Osteitis or **Ostitis.** Inflammation of bone.

Osteoclast. An instrument for breaking bones (bow-legs).

Osteoma. When alone, benign; new formed bones found in the soft parts, such as the pleura or the diaphragm, but often combined with sarcoma.

Osteomalacia. A disease mostly of pregnant women; by the loss of inorganic salts bone which was hard and fully formed becomes softened and twisted, sometimes necessitating cesarean section.

Osteomyelitis. Inflammation of the marrow of bone.

Osteoplasty. Operation for bow-legs or knock-knees, for the cosmetic effect.

Osteosarcoma. A sarcoma containing bone.

Otitis media. Inflammation of the middle ear. Diagnostic:

O. m. c. c. Otitis media chronica catarrhalis.
O. m. c. a. Otitis media catarrhalis acuta.
O. m. p. c. Otitis media purulens chronica.
O. m. p. a. Otitis media purulens acuta.

Ovary transplantation. Taking a healthy ovary from one woman and sewing it into place in the body of another woman (1) to correct sterility; (2) to keep the valuable ovarian secretions acting to prevent neurasthenia or masculinity.

P

Papillomata. Warty growths, fibromata, of the skin; a papillary outgrowth covered with epithelium.

Paracentesis. Puncture into a body cavity (ear, ab-

domen, bladder, thorax, cornea); a "paracentesis knife" for ear work has a very small two-edged blade, so small that it can pass through a small ear speculum.

Parenchyma. The essential or working part of an organ (*e. g.*, the kidney); the body without the covering.

Paresis. Some, but not complete, loss of muscular power (intestinal).

Patent. Open or exposed, as a valve.

Patulous. Expanded or open.

Pedicle. The stem or stalk of a tumor or cyst.

Pediculated cyst. Growing from the broad ligament and having a pedicle.

Perichondrium. The fibrous coat of cartilage.

Perineum. The floor of the pelvis from pubes to coccyx (adj., *perineal*).

Peritoneum. Serous sac lining the whole abdominal cavity and containing the viscera (adj., *peritoneal*).

Peroneal. Pertaining to the fibula, or small bone of the leg.

Do not confuse these three terms.

Periosteum. Fibrous covering of bone—not to be destroyed.

Periostitis or **Periosteitis.** Inflammation of the periosteum.

Petechiæ. Very minute hemorrhages into the skin; sometimes seen in the newborn and others (adj., *petechial*).

Phagedena. A rapidly spreading destructive ulcer of the soft parts.

Phlegmon. Inflammation with spreading of purulent exudate within the tissues.

Pia mater. Membrane covering the convex surface of the brain, the middle one of the three meninges.

Pneumothorax. Air in the pleural cavity—(1) injury to the chest wall, going into it from without, (2) or from the lung channel, as if coming out, (3) or by ulceration or suppuration in adjacent organs, intestines, esophagus, etc.

Polypus. A tumor with a pedicle, as a growth in the ear, nose, bladder, uterus, urethra, or rectum.

Prepuce. Foreskin; fold of skin lined with mucous membrane under which dirt accumulates.

Primary union. The clean joining of two edges of a wound, as in a herniotomy. One should always be very ambitious to have primary union of severed tendons; for instance, where function would be seriously impaired. Divided nerve ends cannot have union.

Procidentia. Prolapse, a falling down (of the uterus).

Prolapse. A falling down (as of the rectum).

Prostatitis. Inflammation of the prostate gland from old age, injuries, or gonorrhea.

Proximal. Of the two ends of an object; the nearer to a chosen point.

Psoas. Muscle of the loin and pelvis.

Ptosis. Drooping of the eyelid with loss of nerve power; dropping of the intestine or stomach.

Purulent. Not *pussy*. Containing pus.

Pus. Liquid formed of dead and living bacteria and leukocytes; also the fluids they have thrown off in their conflict in a part that has been inflamed.

Pustule. A small elevation on the skin containing pus.

Pyæmia or **Pyemia.** Following septicemia fresh suppurating foci are developed all over the body; metastatic abscesses.

Pyelitis. Inflammation of the pelvis of the kidney (the main part).

Pyosalpinx. A tube distended with pus.

R

Rachitis. Malformation of chest and bones due to improper nourishment. When placing a rachitic patient on the operating-table one is surprised to find such irregularities in the bones of the legs that they can hardly fit into the stirrups.

Ranula. A small tumor, very troublesome, in Wharton's duct obstructing the salivary fluid.

Rectocele. A sac of relaxed vaginal wall, posterior, pushed down by the relaxed front wall of the rectum.

Rectovaginal fistula. Usually congenital; unclean; accompanying imperforate anus.

Renal. Pertaining to the kidneys.

Resolution. Return of a part to normal after some diseased condition, as of the lung in pneumonia.

Retained (placenta). Left in when it should normally come out, also as of a soapsuds enema.

Retroflexion. Bent backward on itself (uterus).

Retroversion. Falling back as a whole without doubling on itself.

Rupture. A bursting of a sac or blood-vessel (also of an inflamed appendix); the lay word for *hernia;* incorrect because there is only displacement.

S

Sac. A bag or the bulging cover of a cyst or tumor; in hernia, the bag growing around the dropped loop of intestine; a natural cavity.

Sarcoma. Travels by way of the blood-vessels, to distinguish it commonly from carcinoma. It is malignant and found in early life. It occurs in the skin, subcutaneous tissue, subserous connective tissue, fasciæ, periosteum, and choroid of the eye most frequently. It is also found in the brain, cord, lymph-nodes, uterus, ovary, bladder, and kidney, from which last it can be projected into the lungs and heart.

Sebaceous. Pertaining to the oil-glands of the skin.

Septicæmia or **Septicemia.** A condition in which bacteria and their toxins are distributed all through the body by the blood and the lymph.

Septum. A partition, may be deviated, in the nose; sometimes a double vagina is found with a septum between the two halves.

Seropurulent. Having partly the nature of both serum and pus.

Serous. Pertaining to or resembling serum.

Serum. Clear yellowish fluid separated from the blood after the coagulated fibrin is removed.

Severed. Cut in two, as a tendon or a nerve.

Sinus. (1) A large channel containing blood, as the lateral sinus, disturbed in some ear operations; (2) a cavity within a bone (frontal); (3) a worm-like opening from tissues for drainage in an old wound; an effort of nature to show that some foreign body has been left in, as silkworm-gut instead of chromic gut.

Slough. Death and throwing off of tissue, as after a deep burn.

Spasm. Sudden muscular contraction with pain.

Stenosis. Constriction or narrowing of a passage so that what should normally pass through cannot, as aortic stenosis or stenosis of the cervix.

Strangulated. Compressed and twisted so as to cut off the blood-supply, as in a hernia; black and gangrenous.

Strabismus. Squint. Do not say "strabismuth"!

Stricture. Narrowing of a canal from inflammation of its inner walls; frequently from infection, not always.

Subinvolution. Imperfect contraction of the uterus after childbirth.

Supernumerary. Extra, as of a thumb or any other digit sprouting out from the base of the normal one.

Synovitis. Inflammation of the synovial membrane; may be suppurative.

T

Teratomata. Congenital growths containing all forms of connective tissue (cartilage, hair, skin, teeth, nails, bone, glands), and found in the end of the spine, head, neck, glands, and generative organs, probably part of another fetus.

Thickening. A swelling due to old inflammation.

Thrombosis. Organized blood-clot blocking a vein.

Tight lacing. Cause of displacement of kidneys, pancreas, liver, and uterus.

Torsion. Twisting, as a big tumor on its pedicle, becoming a strangulation.

Transplantation. Applying to one part the tissues taken (1) from the same body; (2) or from the same part of another body like it.

Transposition. Wrong position from birth, as liver on the left, heart on the right, etc.

Transudation. Passing of fluid through a membrane, as blood through its vessel walls.

Trauma. Condition of being wounded.

Tubal pregnancy. Growth of fertilized ovum in the tube.

Tubercle. A specific lesion produced by the germ of tuberculosis (the tubercle bacillus); a nipple or nodule of diseased tissue visible to the naked eye.

Tuberculosis of the joints or peritoneum is operable; opening for drainage or exposure to direct sunlight.

Tumors. Circumscribed new growths of tissue—nodular, tuberous, fungoid, polypoid, papillary, dendritic, or lobulated. Some are benign, others malignant.

U

Ulcer. Gradual death of the tissue of the skin or mucous membranes.

Ulceration. Necrosis with erosion (wearing off) involving the surface of the skin, mucous or serous membrane, due to inflammation or cutting off of nutrition.

Urachus. Remains of fetal life sometimes found in the abdomen during an operation for a different purpose; a canal about 6 cm. long, with a small opening into the bladder or entirely closed at that place; if there are certain congenital malformations the urine may flow through the urachus; in the adult a slight distention visible up to the navel shows that the urachus was never obliterated.

V

Varicocele. Veins of the spermatic cord dilated and forming twisted masses.

Varicosity. A swollen vein, knotted and tortuous, resembling a bunch of grapes.

Vascular. Having many blood-vessels.

Vesicovaginal fistula. Requires a special bed; an opening from the bladder to the vagina with constant dribbling of urine; very common after childbirth, due to pressure and necrosis before the invention of obstetric forceps. If a patient's bladder is full the surgeon may snip it accidentally, causing a vesicovaginal fistula. Sims earned the eternal gratitude of his time by repairing it completely with silver wire.

Vicarious. Relating to an habitual discharge of blood in an abnormal part of the body, but never in the vagina, as a substitute for menstruation.

W

Walled-off. Shut in or bounded by a solid body of leukocytes in nature's effort to check the invasion of bacteria.

Wen. A sebaceous cyst.

Whitlow. Same as *Felon.*

CHAPTER XIV

LIST OF INSTRUMENTS FOR CERTAIN OPERATIONS

Head.—*General Work.*

Scalpels.
Mouse-tooth forceps.
Anatomic forceps.
Artery clamps.
Scissors.
Sharp retractors.
Periosteal elevators.
Trephines.
Gigli saw with its handles (Figs. 21, 22).
Bullet searcher.
Rongeurs.
Sharp curets.
Mallet.
Chisels.
Gouges.
Probes.
Aspirating needles and syringe.
Needle-holder (Fig. 23).
Bone-wax.
Twisted catgut drain.
Rubber tissue drain.

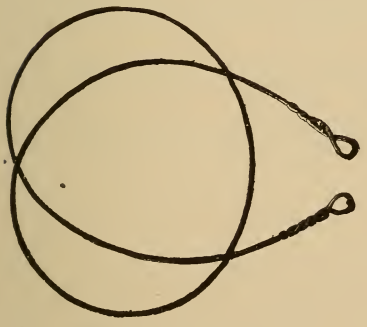


Fig. 21.—Gigli saw.

Fig. 22.—Handles for Gigli saw (in pairs).

Needles.—(1) Small round body and very fine catgut for the meninges; (2) medium-sized curved Hagedorn for

scalp for silkworm-gut or silk (to be removed), or curved needle with cutting edge.

Accessories.—Lighting of the room, headlight, dressings, towels, laparotomy sheet, sand-bags; sterilize electrodes, cover all electric appliances near the wound with sterile gauze; have clippers, a safety razor, and a good common razor; put a bandage around the brow for constriction; starch bandage is put over all and wet to set; the hair at the edge of the shaved area is plastered down with gauze steeped in collodion.

Notes.—The head nurse should make a drawing of the various layers—hair, scalp, periosteum, bone, dura mater, pia mater, arachnoid membrane, and brain tissue.

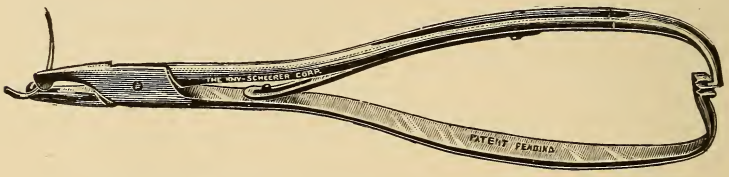


Fig. 23.—Richter needle-holder (5½ to 8 inches).

For all intracranial work *keep the blood-pressure apparatus on hand.*

Mastoid.—This list provides enough for the assistant also:

5 rongeurs (McKernon, Adams, Pyle, Janvier, bulldog).
1 mallet.
3 chisels (graded).
3 gouges (graded).
4 spoon curets.
2 ring curets.
2 periosteal elevators.
2 sharp retractors.
1 mastoid self-retaining retractor.
2 Mayo retractors.
2 mouse-tooth forceps.
2 thumb forceps.

2 grooved directors.
2 probes.
2 scalpels.
2 scissors (straight blunt, curved blunt).
1 needle-holder.
12 artery clamps (6 curved, 6 straight).
1 mastoid syringe (metal ground, no washers).
6 needles (2 small curved round body for possible use of catgut Nos. 1 and 2; 4 medium-sized full-curved Hagedorn for silkworm-gut for the skin) and silk suture material.

Accessories.—Nurses' sponge table must always have scissors, thumb forceps, and in abdominal cases long uterine dressing forceps are very handy; plain gauze packing; iodoform packing; a nurse usually holds retractors; use stout needles for the scalp, but in a radical operation use small round needles for the narrow, deep cavity; one glass basin for 95 per cent. alcohol; medicine glass, smear-glasses; slides; swabs; special mastoid dressing, mastoid tips; three bundles special sponges; towels; pitcher; saline; carbolic acid (5 per cent.) and basin to steep an old syringe with leather washers; one plug of iodoform gauze for the sinus; one narrow strip of plain gauze for the canal.

Notes.—Special dark room or darkened room; watch ventilation. In applying bandage move patient up until his shoulders are over the head of the table, then support by the hair and the shoulders; watch for pus, and do not sponge it away, wait for a smear to be taken; infections may run the full length of the sternocleidomastoid. The ward nurse should be severely punished if the patient's head has pediculi or if the hair is not properly combed and braided in the special mastoid way, slanting toward the good ear. The hair must be fastened down along the edge of the shaved area by a strip of gauze steeped in collodion, sand-bag under neck—a special shaped sand-bag, small and flat.

Cataract Operation.—Instruments generally brought or selected by the operator:

Right or left speculum.
Fixation forceps.
Cataract knife.
Iris forceps.
Iris scissors.
Iridectome.
Cystotome.
Spoon.
Iris repositor.

Accessories.—A bandage (2-inch), very best gauze, double figure-of-8; special woven woolen or linen bandages, p. r. n., black satin mask over all; eye pads; gauze to drop lens on; cotton moistened in sterile water for sponging leaves no threads; no pressure on eyeball; assistant must be in good physical shape to hold the lens steady; be sure which eye is to be operated on; cover the good eye; keep blood washed off instruments during the operation. All orders must be most accurately written down concerning wraps, catharsis, diet, etc. The ethical behavior of the hospital staff preceding a cataract operation has much to do with the patient's behavior during the cutting. If they instil confidence, his nervousness being reduced, he will not "squeeze" so much.

Notes.—For nursing cataract cases the patient must keep his orientation by being told where he is taken after bandaging. When putting him to bed the nurse tells him which direction his head is toward, etc. *He must not catch cold and sneeze;* there should be no draughts on or near him; he must be lifted more gently than any other patients. Cleanse eye knives in benzine or in soapy water and alcohol, rinse and wipe on old soft linen. Test knives on a drum for sharpness—*i. e.*, a kid glove wrist stretched over a napkin ring or a tiny embroidery hoop. Boil blunt instruments only.

Submucous Resection of the Nasal Septum.

Nasal speculum.

Applicators, *metal,* for the preliminary cocainization to swab strong cocain on the mucous membrane; *wooden,* previously wound with cotton on *both ends,* for wiping blood from the field during the operation. Of these

there should be several dozen *sterilized* and ready for use.

Septum knife.

Elevators, of which the Freer and the Killian are the most common types (sharp and dull).

Ballenger swivel knife (two sizes).

Speculum or retractors for separating the flaps.

Forceps (various types) for removing portions of the bony and cartilaginous parts of the deflected septum.

Chisels (flat or grooved, or both).

Mallet.

Septum or intranasal needles for the insertion of sutures.

Sutures—silk.

Nasal dressing forceps.

Gauze strips, iodoform or plain (packing), or the Beck rubber nasal packing bags made on the principle of the Voorhees obstetric bags, inserted, filled, and pressing to prevent hemorrhage.

Syringe of 5-c.c. capacity if injection method of anesthetization is employed.

Frontal Sinus Operation (Radical).—A radical operation is made by a wound between the brows; an indirect or conservative is done intranasally. An acute infection at its first height may be successfully treated intranasally. but a chronic or neglected acute case must be treated radically.

Small trephine; diameter of not over 5 mm.

Scalpel.

Thumb forceps (dissecting).

Artery clamps (6).

Periosteal elevator.

Chisels, gouges, and mallet.

Electric burr or drill is preferred by some operators.

Curets.

Intranasal bone forceps of various types.

Wound retractors.

Probe.

Scissors (straight and curved on the flat).

Needle-holder and silk gut for the skin on Hagedorn curved needle.

Radical Operation on the Ear (Removal of Ossicles).—Same as Mastoid plus:

4 cotton applicators.

2 flap knives.

1 gauze strip for retractor (to pull ear forward, out of the way).

Specula (graded sizes).

10-day chromic gut No. 10.

Accessories.—Some men do a skin-graft into the middle ear from the patient's thigh. Others cover the graft with some fine prepared sterilized animal membrane to facilitate its "taking."

Jugular Operation Following Sinus Thrombosis.—Always an emergency operation, a septic thrombus in the lateral sinus, causing chills and fever, to relieve which a portion is excised and collateral circulation established.

Infusion set for shock.

Scrubbing-up set.

Saline, cold and hot.

Silk gut.

Blunt retractors (so as not to puncture the vein).

An extra stock of artery clamps.

A plug of gauze for the sinus.

Iodoform and boric acid powders in insufflators (sterile).

Stout ligatures of plain catgut No. 3 for the two ends of the excised vein.

Note.—Save the specimen; have hot-water bottles with double flannel covers in readiness; bandages, 2-inch gauze.

Strabismus, Operation for.

Speculum.

Fixation forceps.

Conjunctiva forceps and scissors.

Strabismus hook.

Tendon scissors and sutures.

Conjunctival sutures—6 black silk sutures, 8 inches long, iron-dyed, on small curved needles—have ready early.

Enucleation of Eye.

Speculum.
Fixation forceps.
Conjunctiva scissors.
Strabismus hook.
Tendon scissors.
Stronger scissors.
Pressure pad (to stop oozing).
Conjunctival sutures (see above).

Accessories.—Two flat pads of cotton, diameter $2\frac{1}{2}$ inches, moistened in boric acid (2 per cent.), to lay in the empty socket, then dry absorbent cotton.

Notes.—Mark carefully the eye to be enucleated so that there will be no mistake. Cover the good eye.

Adenoids.

Mouth-gag.
Tongue depressor (metal).
Headlight.
Adenoids forceps.
Adenoids curet.
6 sponge forceps.

Tonsils.—Add long blunt scissors curved on the flat, tenaculum forceps, tonsil snare (or tonsillotome, old method). Tonsil dissecting knives, right and left, wires to thread snare, and the tonsillar hemorrhage needle designed by Dr. Lovell and made by Ermold.

Accessories.—Alcohol (95 per cent.), adrenalin (1:1000); rubber cap for patient. Neck of gown very loose. Rubber sheet for turning patient from left shoulder out over chest under right shoulder, and at least $\frac{1}{2}$ yard out from left shoulder again; it should be one-half as long again as the patient's measure around the shoulders. Waste pail with sieve to drain sponges; sterile towel over rubber; laparotomy sheet; towels in a basin of ice with just enough water to wet them through; numerous small sponges on sponge forceps; severe hemorrhages may occur.

Notes.—Protect walls, floor, and furnishings. Do not throw out specimens; the surgeon will want to show them to the parents. Keep the patient at the extreme right of the table; wipe his nose frequently to let air through,

with a downward stroke; let the air clot the vessels in the adenoid area. Patient goes down on the stretcher face downward, also in bed.

Pharyngeal Abscess.—Knife, all the blade wound with adhesive except the first ½ inch at the tip to prevent its going in too far. If the patient chokes, use artificial respiration and run for the tracheotomy set. Hemorrhage may ensue, in which case the methods after tonsillar hemorrhage are used. Let the patient sit up, if not anesthetized, in bed with a back-rest. Turn him quickly to the same side, so that pus may flow down the same cheek without crossing the epiglottis.

Accessories.—Lights, rubber sheet around patient's neck, pus basin and waste pail, mouth-wash.

Tracheotomy.

Scalpel.
2 mouse-tooth forceps.
Artery clamps.
Medium and small sharp retractors.
Small blunt retractor.
Curved and straight scissors.
Probe.
Dressing forceps.
Needle-holder and needles.
Tracheotomy tubes, assorted sizes, with their inner tubes.

Accessories.—Tape in tubes; tie at one ear; split compresses; gauze fluffs wet in soda bicarbonate solution; oiled silk bib; pheasants' feathers. When the inner tube comes out mark its length on a feather and never put the feather in any farther. Do not tickle the trachea; do not expose the patient's chest for fear of pneumonia.

Brain Abscess (from Mastoiditis).

2 brain knives, curved and straight.
Spade retractors, very large, square.
Clamps.
Encephaloscopes, 3 sizes.

Skin-grafting.

Special skin-grafting razor with thin edge, thick back, and handle adjusted at a slant.

Tissue curet.

Scissors, blunt, curved on the flat.

3 spatulæ, assorted sizes.

2 packers (to pick at skin on spatula).

4 slides.

Cotton applicators.

Tepid saline in glass dish.

1 pipet.

Sponges. Towels.

Roller dressing.

Silver leaf (in book), sterile or rubber tissue.

Flat compresses.

Adhesive straps.

Pledgets of aristol (fluffed cotton, size of peas, rolled in aristol) sterilized in glass test-tubes, and dropped to place.

Notes.—For a burned area the scissors or curet may be used to remove excessive granulations. Assistant or nurse may keep saline dripping on razor and graft (substitute for blood).

Breast Amputation.

Dissecting set.

Very large number of artery clamps.

Drainage-tubes.

Ligatures of plain catgut No. 1 (very many).

Silk or silkworm-gut for skin sutures.

Tension sutures (silkworm-gut) at surgeon's choice (long).

Needle-holder.

Needles, usually curved Hagedorn or cutting edge, but may be straight Hagedorn.

Accessories.—Large gauze pads; hot saline towels on large bared area; cotton under axilla, hand, and at elbow; 4- to 6-inch bandages of gauze and muslin; a *special breast binder* (Figs. 24, 25) with a sleeve for the affected side, the sleeve being split on the upper side and fastened with

tapes. This holds all the axillary dressing beautifully secure. Be prepared for shock and hemorrhage. An additional nurse holds the arm above the patient's head. *Do not allow the orderly to be present.* A very large area must be prepared for this operation, per the rules of the

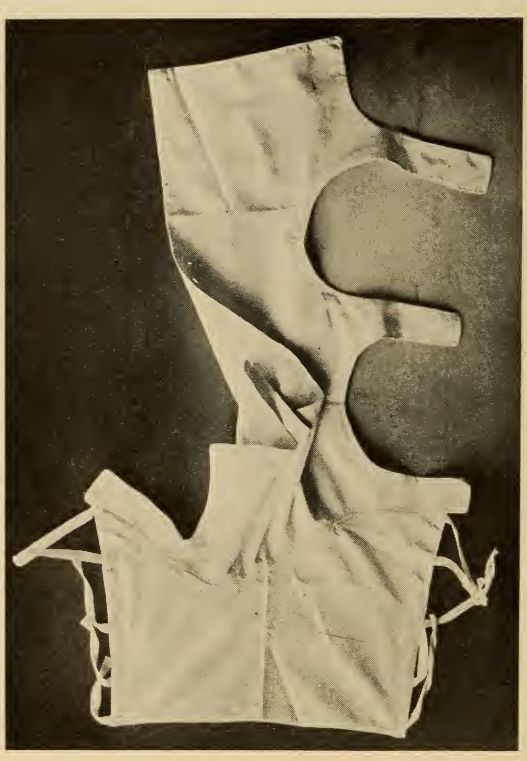


Fig. 24.—Binder for breast amputations—sleeve spread to show pattern.

house as written in the standing-order books. Every vessel is tied off.

Empyema: (*a*) Aspiration, (*b*) Incision, and (*c*) Rib Resection.

(*a*) *Aspiration.*—Unless otherwise specified, the patient is prepared posteriorly on the side affected. Set a child up over the nurse's shoulder.

Syringe and needles in good order.
Iodin.
Cotton.
Collodion.
Gauze.
Large graduate to measure pus, unsterile.

Fig. 25.—Binder for breast amputations—sleeve folded.

Rubber sheet to protect patient and bed.
Towels.
Basins, assorted, to hold pus.
Camel's-hair brush.
Sponge forceps.
Small glass graduate, sterile, for specimen to laboratory.

(*b*) *Incision.*—Lay child on the good side, resting her anterior chest wall on the pillow (covered with rubber), bringing her arm forward so that she does not lie on it.

Scalpel.
Hemostats.
Ligatures, No. 1 catgut plain.
Curved scissors.
Sharp retractors.
Mouse-tooth forceps.
Thumb forceps.
Drainage-tubes.
Pus basin.
Graduates (sterile, small; unsterile, large).

Note.—Note change in color, respirations, etc.; point out all such data to juniors for instruction.

(*c*) *Rib Resection.*—Add to set in (*b*):

Periosteal elevator.
Costotome (rib-cutting).
Bone hook.
Needle-holder.
Round needles for ligatures (No. 1 catgut plain).
Silkworm-gut on curved Hagedorn for skin.
Rubber-dam and drainage-tube.

Politzer bag and tube bottle from oxygen tank, the latter to produce vacuum and extract pus, or empyema button (spool).

Pads, towels, sponges.

Unguentine or boraline to smear over skin before applying rubber-dam.

Appendectomy.

Intestinal forceps to grasp colon (Fig. 26).
Scalpel.
Mouse-tooth forceps.
Plain forceps.
Artery forceps.
Sponge-holders.
Retractors.
Ligature carrier.

Fig. 26.—Viscera forceps. Method of covering jaws with rubber tubes.

Ligatures—catgut No. 1 for abdominal wall; catgut No. 2, chromic, to ligate appendix.

Scissors, curved and straight.

Specimen dish.
Cautery.
Carbolic acid and alcohol (pure).
Needle-holder.
Probe.
Split compress.
Rolled gauze to wall off.
Saline.
Tape sponges with rings slipped through their tapes.
Drainage-tubes.
Cigarette drains.
Towels.
Towel clamps.
Outfit for lavage.

Needles—(1) Small round c catgut No. 1 plain for peritoneum; (2) stout short round c chromic No. 2 for muscle; (3) straight cambric needle or fine round intestinal needle, with fine silk for purse-string suture to invaginate the stump; (4) long, heavy curved needles with silkworm-gut for through-and-through outer sutures, especially if around drainage-tube, or Michell clips, with special forceps (Figs. 27, 28).

Cholecystotomy, Cholecystectomy, Choledochotomy.

Dissecting set.
Long stout probes.
Gall-stone spoons (Fig. 29).
Gall-stone forceps.
Gall-bladder clamp.
Long sounds.
Artery clamps.
Ligatures (catgut No. 3).
Aspirating syringe and needles.
Sponge forceps.
Scissors (blunt, curved, straight).
Retractors.
Cautery.
Carbolic acid and alcohol.
Specimen dish.

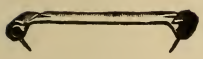


Fig. 27.

Fig. 28.

Figs. 27, 28.—Michell's suture clips and forceps.

Fig. 29.—Mayo's double-ended gall-stone scoop.

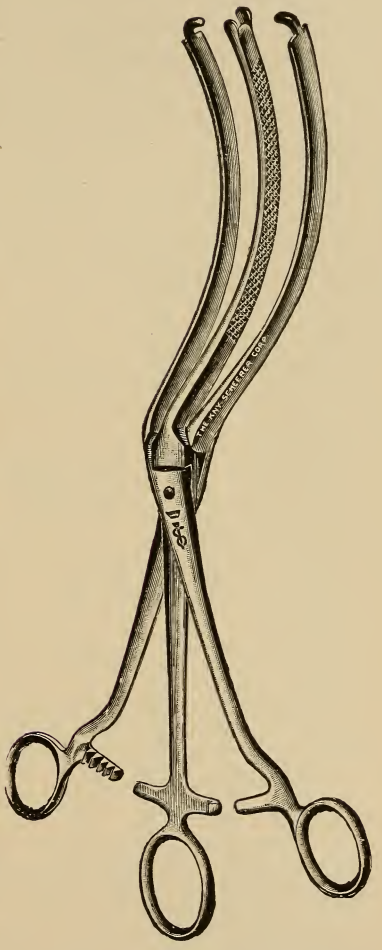


Fig. 30.—Gastro-enterostomy forceps—3 blades, 13½ inches.

Sterile pus basin.
Drainage-tubes.
Packing (plain gauze, two widths).
Gauze to wall off.
Sponges.
Tape-sponges on rings.
Rubber tissue apron.
Sutures and needles—(1) fine silk on small round body, full-curved, for deep work on gall-bladder; (2), as in appendectomy.
Needle-holders, two sizes.
Small hemostatic needle in opening duct, with silk.

Gastrostomy, Gastro-enterostomy, Gastrectomy.

Dissecting set.
Retractors.
Sponge forceps.
Ligatures (chromic Nos. 2 and 3).
Artery clamps.
Ligature carrier.
Scissors (curved and straight).
Stomach clamp (Fig. 30).
Needle-holder.
Gauze packing, plain.
Gauze rolls to wall off.
Saline.
Tape-sponges on rings.
Sponges.
Needles (fine silk or straight needles, plain and chromic catgut, as for other laparotomies).
Drainage-tube.
Fluffs of gauze.
Cotton pads.
Outfit for lavage, tube, pus basin, pail, pitcher of tepid water, rubber sheet.

Hysterectomy.

Dissecting set.
Retractors, 3 sizes.
Clamps (6 long straight, 6 long curved, 12 small).

2 aneurysm needles, right and left (Fig. 31).
1 bladder sound, to mark the top of the bladder.

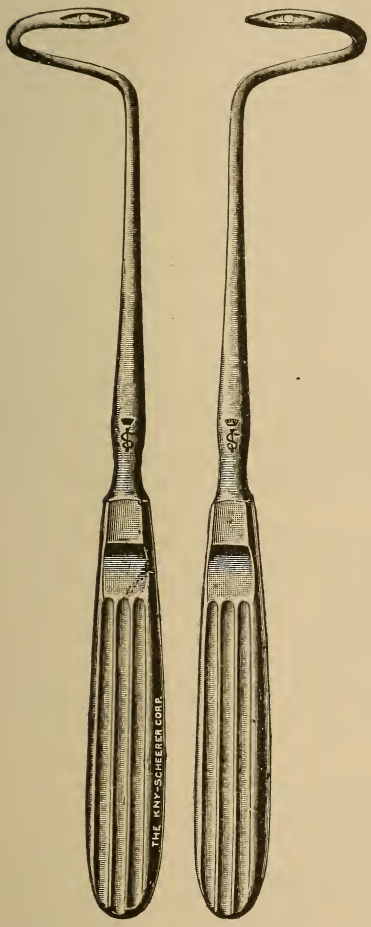


Fig. 31.—Aneurysm needles, right and left.

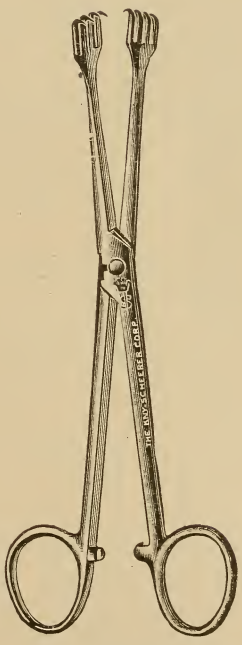


Fig. 32.—Vulsellum forceps (double tenaculum).

6 sponge forceps.
Dressing forceps (uterine) to thrust into vagina to draw down drain.

Vulsella, extra strong (Fig. 32).
Cautery.
Aspirating syringe and needles.
Ligatures (braided silk for pedicle; plain catgut No. 2 for adhesions; plain catgut No. 4 for broad ligaments).
Pedicle clamps.
Blunt scissors, curved on the flat.
Blunt straight scissors.
Sharp scissors (straight, curved).
Tape-sponges on rings.
Hot saline.
Vaginal packing.
Extra glove for nurse guiding packing.
Sponges.
Needle-holder.
Sutures (catgut No. 1 for flaps on small curved needle; catgut No. 2 for broad ligament on half-curved needle).
Notes.—Be prepared for collapse when in Trendelenburg. Provide many footstools, graded in height and length.

Cesarean Section.

Dissecting set.
2 large clamps for the cord.
2 aneurysm needles.
Stout Esmarch rubber tourniquet.
Sutures of heavy silk in half-curved needles, fine silk in full-curved needles.
Placenta basin.
Large floor basins under the patient's drainage.
Usual sutures for peritoneum, etc.
Scissors, straight and curved.
Tape-sponges on rings—very many.
Gauze to wall off.
Hot saline.
Sponges mounted on forceps, very many.
Infant.
Reception blanket.
Mouth-wipes.

Blow-outs.
Cord instruments.
Cord, tape, and binder.
Basket.
Hot and cold tubs.
Eye solutions.
Extra physician and nurse.
Hot-water bottle.
Pulmotor.
Oxygen tank and catheter (intranasal).

Note.—Be prepared for hysterectomy or ligation of Fallopian tubes.

Herniotomy.

Dissecting set.
Hernia knife (Fig. 33).
A piece of sterile tape 10 inches long to slip under the cord as a retractor.
2 sharp 4-pronged retractors.
2 blunt hooks.
Artery clamps.
Ligatures of catgut Nos. 2 and 3 plain.
Sutures—(1) Deepest, kangaroo tendon on medium-sized, sharp, half-curved needles; (2) for sac, plain catgut No. 2 in medium-sized, full-curved needle; (3) silk or silk gut for the skin.
Needle-holder.
Tape-sponges on rings, hot saline, towels, etc.
Large gauze fluffs.
Rubber tissue to protect dressing.
6-inch bandages—(*a*) gauze, (*b*) muslin. For inguinal and femoral, etc., a spica is put on protected with oiled silk cuffs and adhesive (Fig. 34).

Nephrectomy, Lumbar Route, Nephrotomy, Etc.

Dissecting set.
Ligature carrier.
Clamps.
Aspirating syringe and needles (longest and largest).
Sponge-holders.

Ligatures (rubber, heavy twisted silk, catgut No. 4).

Set for rib-resection (costotome, bone hook, periosteal elevator).

Compresses 4 by 16 inches and from four to eight thicknesses.

Fig. 33.—Hernia knife.

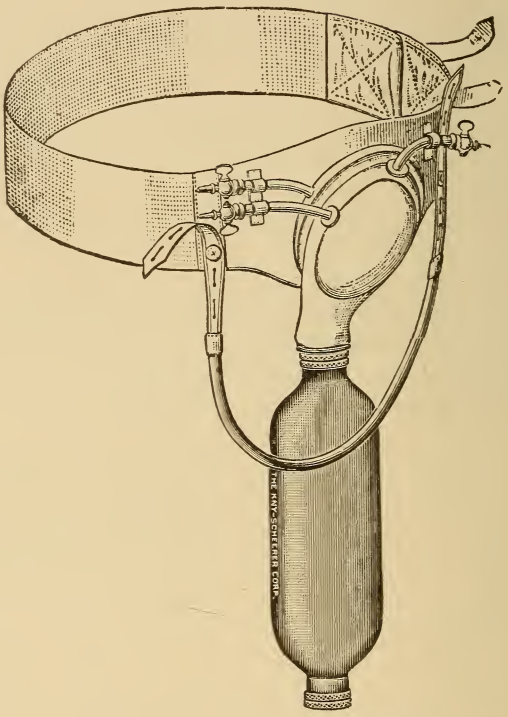


Fig. 34.—Colostomy bag—receptacle for artificial anus, soft rubber with belt adjusted to left side. French pattern.

2 red rubber drainage-tubes, ½ by 8 inches.

Narrow gauze drains.

Needle-holder.

Sutures—silkworm-gut for outer wound in heavy full-curved needles; catgut No. 2 for the skin; chromic gut No. 2 for muscles; catgut plain Nos. 2 and 3 in long sharp

full-curved needles, and small half-curved needles for the pelvis of the kidney.

Accessories.—Patient lies on his abdomen on a kidney bag, inflated, with the diseased kidney the higher; instruments cannot lie flat on him; kidney bag under the loin of the sick side; give him a pillow and put his arms in a comfortable position to prevent paralysis. The nurses

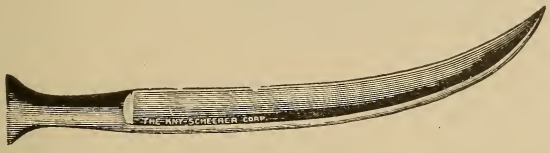


Fig. 35.—Sharp-pointed curved bistoury.

should try this themselves. Surgeons may need foot-stools. To "deliver the kidney" means to bring it out through the cut with a "gush." All towels must be pinned or clamped. *Be sure that the work is on the sick kidney* (Figs. 35, 36).

Fig. 36.—Probe-ended bistoury.

Curettage.

Specula (Sims and weighted).
Vulsellum.
Uterine sounds and probes.
Uterine dressing forceps.
Packer.
Sponge forceps.
Anatomic forceps.
Straight scissors.
Kelly pad.
Towels.
Vaginal sheet and triangles.
Dilator.

Curets.
Intra-uterine douche tip.
Rubber tubing for douche tip.
2 iodoform strips 1 inch wide.
1 iodoform strip 3 inches wide.
Pad, safety-pins, and **T**-binder.
Douche of plain sterile water in irrigator at 120° F.

Trachelorrhaphy.—Add to the above:

1 long pair mouse-tooth forceps.
Scalpel.
Tenaculum.
Artery clamps.
Sharp scissors curved on the flat.
Needle-holder.
Cervix needles.
5 sutures (silver, wire, and wire twister, chromic gut Nos. 2 and 3).
Wire scissors, shield, and "counterpresser."

Perineorrhaphy.—Add to above:

Kelly's crooks (as retractors).
3 vulsella.
Special perineal needles.
Antiseptic powder.
Gauze packing for vagina.
Silkworm-gut or chromic gut Nos. 2 or 3, or button, shot, or silver wire, and silk to carry it.

Hemorrhoidectomy.—*Ligation Method.*—Local anesthesia.

Brinkerhoff's slide rectal speculum.
Headlight or droplight.
Pratt's bivalve speculum (to deliver hemorrhoidal tumors).
4 Halstead's hemostats, curved, 5 inches, to bite "spurters" or pull down tumors.
1 pair scissors, curved on the flat, blunt, 6 inches (dissecting tumors back to their base).
1 single-toothed tissue forceps, 7 inches (for removing "tabs").

Tank package twisted silk, size 13, or catgut, to ligate.

Cotton, gauze, "whistle" (tampon canula) made of rubber tube wound with gauze and greased copiously.

Wipes, **T**-binder (male or female), rectal pads.

Sponges on sponge forceps.

Notes.—Three 25-minim hypodermic syringes of 2 per cent. cocain or novocain with 5 drops of adrenalin chlorid (1 : 1000) added to each. Sims position, nurse or orderly on side farthest from the doctor holds buttocks apart, sponges, etc.

Operation on Fistula in Ano.

Brinkerhoff slide speculum.

Lights, etc., as above.

Probes, flexible and plated.

Grooved directors, flexible and plated.

One probe-pointed grooved director.

1 Wilm's plated angular director.

Knives—1 straight sharp pointed, 1 curved sharp pointed, 1 straight probe pointed, 1 curved probe pointed.

4 Halstead's hemostats.

1 single-toothed tissue forceps, 7 inches long.

1 pair scissors, sharp straight, 10 inches long.

1 pair scissors, curved sharp, 10 inches long.

1 pair Allingham's rectal fistula scissors.

1 curet.

Ligatures for bleeders.

Gauze, cotton, pads, binder, etc., as per Hemorrhoidectomy.

Three hypodermic syringes, as above, for local anesthesia.

Hemorrhoidectomy.—*Clamp and Cautery Method.*

Speculum.

Pile clamp.

Cautery.

Mouse-tooth forceps.

Artery forceps.

Blunt dissecting scissors.

Scissors curved on the flat.

Scalpel.
Special "screw-crusher" clamp.
Needle-holder.
Needles—(1) Large surgical with catgut No. 3 to transfix large hemorrhoids; (2) straight for small ones.
Sponge forceps.
Catgut ligatures No. 2.
Towel on cautery handle.
Sponges.
Sponge on string to plug rectum during work.

Accessories.—Iodoform or aristol powder; tampon canula or "whistle" well lubricated; split compress; gauze; binder; vaselin; soapsuds for cleansing, saline to follow; rubber apron; Gant pads.

CHAPTER XV

NOMENCLATURE

"Call a spade a spade."

Terms Created by the Workers of the Operating Room in Contradistinction to the Terms Used in Surgical Diagnosis or Pathology.

To the young nurse—Warning! Be hereby advised never to use any term relative to nursing (or anything else, for that matter) whose meaning you do not understand well enough to give a reasonable explanation to the surgeon who knows a great deal more than you do about it, or to the junior nurse who knows less, and has a way of asking very embarrassing questions.

There are many pupils whose previous training in English was of the most circumscribed proportions (what is the English of one year in high school?) and yet, in a hospital, they come out boldly with long terms which they can neither define nor spell correctly. But this can be mastered, and is no reason why they should not be used in their proper place. Some pupils with the limited vocabulary aforesaid pick up these words and play with them as with a new toy, reiterating them until others who can speak English well are bored to death. Learn the derivation of all these terms, and employ them only when that will save time by being concise. The well-educated gentleman is master of many languages, but uses only the simplest Saxon. Plain, simple Saxon is much more forceful and figurative than words of classic origin.

There are certain Latin and Greek roots, not many in all, that are used as a basis for all the terms describing the operations that are performed, and, added to the classic roots that name the different parts of the body,

show at a glance the entire proportions of the work done. The name of the operation appears only about five times per case:

(1) When it is posted in the office or the operating-room calendar.

(2) When the supervisor drills the pupils who are to assist in the anatomy of the parts concerned so as to select the proper instruments and materials.

(3) On the slip sent down to the ward briefly specifying the salient features of the whole affair for the immediate enlightenment of the nurse who is to take care of the ether patient.

(4) On the chart in three places—(*a*) opposite the hour when it took place in the day's sequence of events; (*b*) on the patient's discharge slip; (*c*) and on the history sheet written up at full length by the intern.

(5) And, lastly, in the register kept by the operating supervisor of all cases.

Model of slip sent to ward with ether case:

1. Date.
2. Patient's name.
3. Ward whence patient came.
4. Operator.
5. Operation.
6. Anesthetic.
7. Stimulation.
8. Drainage.
9. Condition.

The word used to signify the disease or cause for operation may be entirely different from that describing the process of cutting, sawing, or sewing; and, again, sometimes a correct diagnosis cannot be made until the operation is almost complete. Again, the same operation may be performed for two entirely different conditions. To illustrate the first, we all know what a cleft palate is, but the operation to repair it is called staphylorrhaphy. Second, an opacity of the lens of the eye is called cataract. The tense, hard condition of the eye due to certain glandu-

lar secretions being blocked at their proper outlet is called glaucoma. But both cataract and glaucoma are relieved by iridectomy. To distinguish carefully between these is a necessary feature in the supervisor's instruction; *e. g.*, *ectomy* means *cutting away* entirely, while *otomy* means *cutting into*. In a different chapter, on Surgical Diagnosis, the terms describing the pathologic conditions causing operation are given. If one is asked what was the nature of the *operation*, she should bravely say, "He had his gall-bladder removed" if she cannot remember "cholecystectomy," but she should not say "cholecystitis" and miss the mark. To *make* the names of all operations place the name of the anatomic part first, of Latin or Greek derivation, and the foreign root, describing the work to be done, last. It is better for pupils to know a few classic roots and "make their own terms" than to swallow unsearched, unprobed, and unknown a bowlful of ready-made terms. *Knowing the why and the wherefore* of everything warms the cockles of the heart in an otherwise dull existence.

Greek words are mostly used for the thing done, whether cutting out, or sewing up, or cutting into for drainage, and Latin, generally but not always, for the anatomic part operated on. In making up new words it is well to remember the rule: Double the final consonant after a short vowel, as *benefit, benefitted; label, labelling*. When one has built up a new term and received the supervisor's O. K. for pronunciation and spelling, the whole term should be written ten times or so for practice. This is one feature that makes the operating-room pupils the despair and envy of the remainder of their class in recitation.

Adeno, relating to glands—of the neck, axilla, etc.

Chole, relating to bile.

Colo, pertaining to the colon, part of the large intestine.

Colpo, relating to the vagina; there are few terms beginning with *vag* to denote any operation.

Cranium, the skull, or bony covering, *not* the brain.

Gastro, pertaining to the stomach.

Hysteron, the uterus.

Jejun, relating to the second part of the small intestine.

Lamina, a plate or layer (posterior vertebral arch).

Nephron, the kidney.

Oöphoron, the part bearing the egg (Greek, *the ovary*). Note the pronunciation and spelling, also the dieresis which is used to divide two vowels that would otherwise be pronounced together as a diphthong (*oo* is pronounced like *oa* in *oasis*).

Ophthalmo, relating to the eye.

Orchi, relating to the testicle (genito-urinary).

Osteo, bone (Latin, *os*, *ossa*). There are, of course, many bones and many varieties of operations on bones, the particular part diseased being specified—*e. g.*, *osteotomy*, division of a bone, but which one must be specified.

Ot, pertaining to the ear.

Proct, relating to the rectum.

Prostat, relating to the prostate gland (genito-urinary).

Rhino, pertaining to the nose.

Salpinx, the tube.

Spermato, relating to the semen.

Tars, pertaining to the instep.

Ten, pertaining to a tendon (in the eye, wrist, etc.).

Trachelo, relating to the cervix or neck of the uterus. There is no word beginning with *cervi* to denote an operation on the cervix.

Tracheo, pertaining to the *windpipe only*.

Uretero, relating to the two pipes or tubes from the kidneys to the bladder.

Urethr, relating to the one canal from the bladder to the outside.

Vas, the sperm duct.

The few classic words describing the work done, or the mechanical process in which instruments are employed, may each be added to any and every one of these,

making a now far from bewildering but very extensive vocabulary. To have three new words radiating from each of the above terms—*gastrostomy, gastrotomy, gastrectomy*—means quite a variety in operating-room experience also. The clever nurse reckons her work up as follows: "I have scrubbed for three appendices, one mastoid, two hernias, and one gastrostomy already," or again, "I'm nearly through my service and I haven't had an iridectomy or a hysterectomy."

-ectomy (Greek, *cutting off*), a complete removal of a part.

-orrhaphy (Greek, *suture*), a sewing up.

-ostomy (Greek, *stoma, a mouth*), making a new opening out of an organ; usually a new path to pass the intestinal contents along in order to get by an obstacle, usually a malignant growth.

-otomy (Greek, *to cut*), a cutting into for drainage.

-plasty (Greek, meaning *form* or *shape*), cutting and trimming off; straightening and smoothing for some purpose.

Sometimes operations are named after the first great pioneer who performed them, but the latest authorities agree that proper names should be banished both in anatomy and surgery, therefore only one of the names of those great surgeons will be mentioned here, much as one would willingly add to their laurels. A strong effort should be unitedly made to abolish this foolish, confusing custom. In anatomy, the parts should be named according to where they are and what they do. In surgery, the operation should be named according to the part affected and the work effected. Simple, concise terms, founded on the primary studies of the medical student, will bring the surgeon into closer touch with the general practitioners who herd the cases in his direction, and with the nurses who are his earnest handmaidens.

There are many special terms used in the operating room relating to *action* rather than to *passive conditions*,

which, therefore, find a more fitting place in this than in the chapter on Surgical Diagnosis. There are also certain words formed according to the rules above given whose pronunciation and spelling are unique. Other names are misnomers, due to slipshod methods. Some names are compounded, part upon part, on account of the masterful efforts made by some of these modern, radical "trouble men," as they call the mechanics in the garages, who can fix anything that is wrong in an automobile. Some of the words listed are of diagnoses often confused with operations. The number is far from complete, and on the blank pages following should be inserted all the new words each nurse hears, with its definition. Some require the insertion of an extra vowel for smoothness of sound.

Adenoids. Hypertrophied tissue in the nasopharynx. Note also the spelling of "pharynx"; *y* is the same in value and pronunciation as *i;* "rynx" = *rinks.* Pronounce like *farinks.*

Anastomosis means a joining, end-to-end, as of two pieces of gut.

Bloodless operation. Usually the name given to the method employed to straighten the limbs in congenital hip-disease. There is no external wound; the bones are broken by manual force, without instruments, and the child immobilized in a "frog" of plaster of Paris, the position being "overcorrected" or exaggeratedly changed.

Bone-grafting or *Bone inlay.* A quite recent discovery; splicing an old, diseased bone with a sound piece; taken usually from the tibia to repair a tuberculous spine.

Bone-plating. A metal plate (the sizes vary) is screwed in place with steel screw-nails to join two ends of broken bone.

Burns or *scars* from other accidents are atoned for by skin-grafting—a *plastic* operation.

Cesarean section. Note the spelling (obstetric term).

Clamp and cautery. Slipshod name for a certain operation to remove hemorrhoids.

Coccygectomy. Pronounce kok-sig-jec-tomy. Note the spelling; a very simple operation, as the name shows.

Craniotomy. Obstetric term.

D. and C. A cloak for abortions that are not necessary sometimes.

Dilatation. "Dilation" is quite as correct.

Excise. To cut off, to remove, especially what is seated near the surface.

Extirpate. To cut away or remove what is deep seated.

Gastro-enterostomy. An opening from the stomach into the intestine, usually the jejunum, to get past some obstruction above the latter; an illustration of a compound word.

Immobilize. To fix, to render motionless, with a splint, a plaster cast, or sand-bags.

Incise. To cut into, as into a boil, for drainage.

Iridectomy. A misnomer; should be qualified by the term "partial" or "incomplete." The whole iris is not removed unless the rest of the eye goes with it. A tiny piece only is cut out, leaving a black patch which is a continuation of the pupil, the whole resembling and sometimes called a "keyhole."

Jejunojejunostomy. Sewing two parts of the same gut together and making a mouth afterward at the point of junction so as to catch any portion of the intestinal contents lurking in the "vicious circle," like a plumber's trap, left above after a gastrojejunostomy, as can easily be seen by a drawing.

Kraske. The name of the surgeon who relieved cancer of the rectum by removing the coccyx and part of the sacrum to form a new opening above the malignant growth.

Ligation. A term for one kind of hemorrhoid operation; tying off the dilated vessels and excising.

Myringotomy. Cutting through the ear drum for drainage.

Needling. An operation on the eye, done as a secondary to the primary iridectomy; lacerating a cataract

with a needle to afford entrance to the aqueous humor and cause absorption of the lens.

Œsophagectomy, Œsophagotomy. Note the spelling.

Panhysterectomy. Extirpation of the whole uterus, in distinction from hysterosalpingo-oöphorectomy (three *o's* together), which means the removal of uterus, tubes, and ovaries.

Plastic. Sewing, trimming off, etc., for repair and cosmetic effect.

Pyloroplasty. Sewing and cutting around the pylorus.

Resection. Wrongly used, to mean taking a piece of rib out, to produce drainage for empyema.

Splenectomy. It is interesting to know that man can live after certain organs like the spleen have been taken out.

Staphylorrhaphy. Operation for cleft palate.

Tonsillectomy. The new method of removing the whole tonsil by snaring it at its base.

Tonsillotomy. Old method of cutting off the top of a tonsil.

Trephine or *Trepan.* Sawing into the skull, generally in three rings or disks, to break off the small bridges remaining without much jar to the patient.

CHAPTER XVI

LINEN OF THE OPERATING ROOM

It is quite easy to calculate how much linen of every kind is needed for an operating room. This depends on—

(1) The kinds of cases and the articles each requires.

(2) The number of cases per day.

(3) The number of nurses and the amount of time at their disposal to *refold*, put up in covers, and sterilize.

(4) Fractional sterilization.

(5) The speed at which the laundry operates for the surgical service.

(6) A possibility of illness among the nurses.

(7) A possibility of breakdown or repairs in the sterilizers.

(8) An abnormal rush in the service at certain seasons.

To start with a great deal of linen is not going to wear it out faster, and it is a great gain to the supervisor's anxious mind. But she should have an inventory of all, and a perfect system of exchange in coöperation with the central linen room, which exchanges at its own pleasure for the rest of the house, but *at her pleasure* for her service.

Patching all holes is absolutely imperative. A sterilized towel is not of any use if it has a hole in it. But patches are no disgrace and offer no disadvantage. On the contrary, to put on patches and to use patched goods are essential in a nurse's training. Whether the nurse does this as a part of her operating-room experience, or in her course on housekeeping under the matron, is a matter of indifference so long as she does it some time. Uniformity is of great advantage both for appearance and speed of work. It is pleasant to see some harmony between the color of walls, table, towels, and stains in

carbolic acid or bichlorid (as warnings for poisons). If towels were originally a red check, and it is desired to change to a blue check, give all the red checks to the wards and buy the blue outright.

White linen is preferable for gowns and caps, since it always looks so snowy. There is no good excuse for the very bad color of most linen, since the reason is a bad one. Operating-room linen should be *bleached in the sun*, especially in slack times, being dried, then *sprinkled down*, and dried again many times, as the Dutch women do. But it is mostly dried in the driers and never gets a whiff of fresh air, soon becoming stuffy and dark. There are many bleaches put on the market and many washing fluids patented which are supposed to whiten linen without labor, but that sort always eats away the goods. A gown or uniform frays in six months or less if laundered with bleaches. By having an extra lot of gowns and bleaching them *with sunshine* money is saved in large quantities. A good system for operating-room linen laundering is as follows:

(1) The linen is sent down with all clots and stains soaked out in cold water and put then into the machines.

(2) Rinse cold twenty minutes.

(3) Warm water and soap twenty minutes; wash by machinery.

(4) Warm rinse ten minutes.

(5) Hot water and soap thirty minutes; wash by machinery.

(6) Hot rinse five minutes.

(7) Hot rinse five minutes.

(8) Hot water and 4 ounces of acetic acid to the machine, ten minutes.

(9) Cold water, add the blue, ten minutes.

Most laundries neglect rinsing. Frequent rinsings clear linen better than anything else. Wyandotte soda with chipped soap precipitates lime salts. These are bought by the barrel. Anilin blue (No. 90) in 1-pound cans is purchased for the coloring. Flannel covers for

masks should be washed with green wool soap and rinsed thoroughly in water with a little glycerin added, then hung in the fresh air with the *stripes vertical.* Gowns frequently lose their tapes, and it is not to be wondered at when one sees the inside of a washing-machine; they should, therefore, be washed in open net bags, similar to those for nurses' handkerchiefs, to prevent tearing or loss. Dome fasteners are better than buttons. These little details of repair should be done by the nurses who scan the articles closely as they prepare them for refolding. Scultetus binders, straight abdominal, and breast binders must be *well ironed.* The nurses' course in the hospital is not complete without having had one month under a competent housekeeper, where they learn all these things, with an eye to future positions of their own, but the present benefit to their training-school and hospital is a sympathy with the office in its enormous outlay, with those humble employees who labor for them, and a determination not to be extravagant.

Every operating room should have its book of measures and patterns with samples of goods and lists of firms furnishing these, their prices, discounts, and length of time in delivering. There should be a set of stencils for marking goods, whether those made by hand in the workroom or grown dim with frequent laundering. The study of standards of weight in various kinds of cloth, such as Canton flannel, unbleached muslin, etc., and thread gauges in gauze forms interesting and valuable work to the pupil.

SPECIAL ARTICLES

Men's T-binders are not like those for women. The perineal strap is split in two, so as to come up at each side of the genitals. The edges are all carefully turned in and stitched, and at the upper end of the split a crow's foot stitched in to prevent a tear. The sizes should vary according to the waist measure, since men vary so in stature and girth.

Men should wear suspensories if to be confined in bed

flat on their back for any length of time. These can be bought, assorted sizes, and put on in the operating room at once after operation. If not purchased wholesale at a low rate, they can be made, by the aid of scissors and a few safety-pins, out of a couple of yards of 4-inch muslin bandage. If not applied, the long-continued horizontal position causes certain inflammation.

Laparotomy gowns and **stockings** are made of thick soft Canton flannel. The gowns are opened at the back with tapes, not buttons, and the *stockings go with them in sets.* Each set should be folded so as to show its mark—A. B. Hospital, lap. gown and sox, 4 ft. 6 in.—54 inches being the total length of the set, it can easily be adjusted to the height of the patients. The stockings should not be folded separate from the gowns. Just as soon as the case is over, a set which has been warming in the blanket warmer or, failing that, on the radiator should be put on instead of the one already wet with perspiration.

Scultetus binders are made of Canton flannel. Nothing else will do. The piece for the back should be for an adult, from 12 to 15 inches long and 7 to 9 inches wide, not allowing for the making. It must be double, therefore is most easily made by taking a piece 24 inches long and folding it once crosswise, and basting it along the edges and down the center to keep it straight while setting in the "tails." There should be ten tails, five on each side, overlapping about 1 whole inch. The tails are *cut,* not torn, and are *overcast* finely, not hemmed, on all edges by hand. The *fold* in the back piece, as in *all binders,* indicates the *bottom.* The patient must not lie on a seam. Five tails are set in on one side with pins, extending inside the back piece about $\frac{3}{4}$ inch, for security in the braiding effect afterward. The basted edges of the back piece are then turned in and the whole basted through, taking care to *remove all pins.* The tails must all overlap an equal amount and in the same direction as well as in the same manner. The opposite side is done similarly, taking care that the tails will be set in in

exactly the same way, so that *both sides will look alike.* Taking up the binder both sides should overlap *downwardly* or both *upwardly,* otherwise it never can be put on properly. It takes a long time to make one Scultetus binder, and if the nurses do it in classes they will never be guilty of cutting one to let a drainage-tube through. In one instance it took a class of six nurses one hour to make one Scultetus binder as a lesson. As to the width of the tails, for a binder of 12 inches depth each of the five tails should be 4 inches wide and overlap 1 inch each. As to the length of the tails, they should come from the back piece on one side, across the abdomen and back to the other side of it, that is, once the measure of the patient's girth less the width of the back piece. If a patient is 40 inches around the abdomen, and we make a back piece 8 inches wide when finished, the tails should all be 32 inches long (not counting the making). Scultetus binders should be made in all sizes, first measuring a few patients with thick cotton-pads and piles of gauze dressings to get them correct.

A maternity **breast binder** with a plain sleeve added makes an ideal dressing for a breast amputation. Make a sleeve of the ordinary men's coatsleeve style of double unbleached muslin, but open it on the outer surface of the arm in a line running from the ring finger to the tip of the acromion process (when the palm of the hand is downward). This opening is closed with tapes, four on each side, about 8 inches long. It corresponds with the opening at the shoulder of the breast binder, whose flaps extend about 1 inch past the sleeve on each side. The dressings of the axilla are easily kept in place and the binder may be reversed. The sleeve need not extend below the elbow. (See Figs. 24 and 25.)

Caps should be of light weight material, but firm. If very slightly starched rather thin material will do, especially in summer. The pill-box type fits so closely that perspiration flows more freely, whereas a tall wedge cap keeps the head rather cooler (Fig. 37).

Masks should be made of heavy dimity, but nothing heavier than that, since even the sheerest is intensely uncomfortable.

Laparotomy sheets should have an opening not more than 10 inches long and 6 inches wide, making at any

Fig. 37.—A becoming cap to either doctor or nurse.

time required about a 16-inch ellipse; for example, in cesarean section. The sheet should be long and wide enough to extend over the body of a very fat patient and reach down not farther than 3 inches below the surface of the table. If a patient is very tall, an extension, in the shape of a table cover, may be used for the feet.

Laparotomy sheets should be of assorted sizes, with the exception of those for small babies, when a large towel may be slit in the manner described.

Vaginal sheets of the style shown in the illustration (Fig. 38) are abundantly required, and can be easily put

Fig. 38.—Vaginal sheet.

on or removed after the vaginal work is done. The sheet goes on over the sterile triangles which cover the stirrups. This is so secure that it makes a sterile table cover over the abdomen for instruments, and is much less confusing than a number of towels and clamps.

Triangles and sheet are folded in sets in such a manner

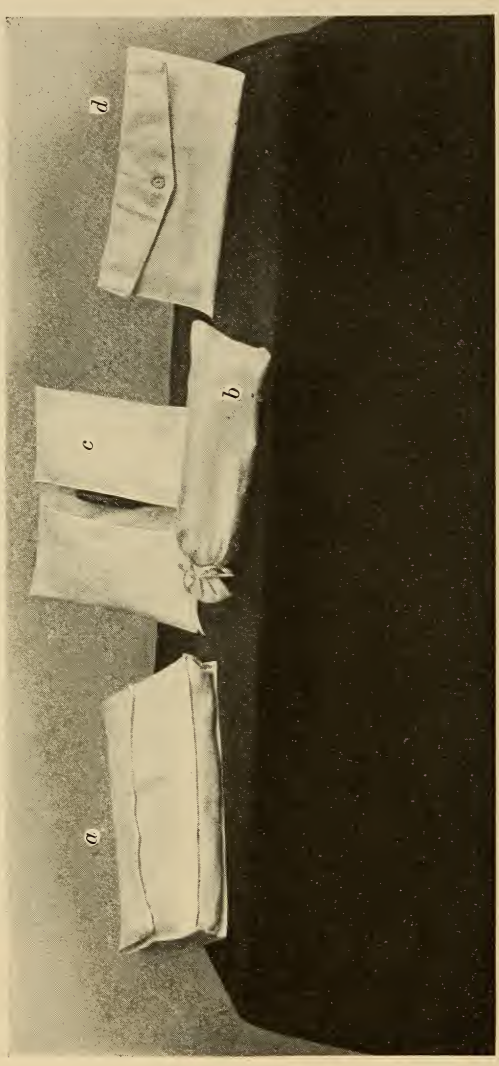


Fig. 39.—Some special covers: (*a*) Gown cover; (*b*) cover for packing tube; (*c*) glove case; (*d*) glove envelope.

that the two former, each into half a square, fit together on top of the square sheet and make a very good-looking

package. A triangle is an unbleached muslin cone to cover the leg and thigh.

For **tubes of packing** it is a waste of time to roll them tightly in a wayward square cover. Make a long narrow double tubular bag (Fig. 39, *b*), with a drawstring at the neck, and put the tube in it. Of these there should be many, one for each tube in the sterile stock, one clean extra for each, one being laundered, etc. All dressing covers, including these bags, should be very frequently laundered and bleached to counteract the burning they get in the sterilizers.

Gown Covers.—Again, it is a pity to ask a nurse to tug with gowns (Fig. 39, *a*). Rather provide covers specially for the gowns. Each should have a double cover with a flap and boxed edges, somewhat resembling a square cushion, and dome fasteners. This saves much time and vexation. These are particularly nice for a private physician's kit. *Glove envelopes* are referred to in Care of Rubber Gloves, chapter on Formulæ and Directions (Fig. 39, *d*).

Folding Linen.—There are two methods of folding linen. By one the article is taken at its full length and folded often enough to be a convenient width—a towel once, a gown twice—then simply plaited, so that it may drop to its full length by only gently lifting one edge (Fig. 40). When a doctor is putting on a gown it is presented to him with the collar uppermost. He takes it by the collar in a clear space in the room, and as he raises it it drops its full length. But the trouble with this method also arises from that very feature. Things opening too easily might be easily contaminated. The one counterbalances the other. The second method is to fold the article from its ends toward its center so as to control it perfectly.

To fold a towel 24 by 30 inches or of similar proportions, lay *k–o* over on *a–e*, *pressing* the fold *f–j firmly*. Bring the double edges *a–k* to *f* and *e–o* to *j* to the center *c–m* to *h*, *almost*, but not quite, to prevent a hump. Now fold from

b–l to *g* and *d–n* to *i* to the center again. Then fold together. In opening this towel hold the folds at *d* and at *b* in the right and left hands respectively, between the forefinger and second finger. Hold the points at *a* and *e* between forefinger and thumb also. Keep the two thumbs close together and the whole towel compressed until, having wedged a way between two assistants, one has space close beside the area to open the towel out sud-

Fig. 40.—Gown and towel plaited in one direction—opening too easily with one movement.

denly like a fan and lay it *in situ*. This method keeps the whole bottom edge, *k–l–m–n–o*, securely fastened between the thumbs until needed (Fig. 41).

In **folding gowns,** hold by the under arm seams and let drop longitudinally into four thicknesses. The nurse keeps the under arm sides next to her and makes them the straight edge. The sleeves are turned (together) at a sharp right angle to this line, straight across the gown, and

when they reach the opposite edge sharply folded back on themselves, perfectly flat and square. *Do not* bring the sleeves down along the body of the gown. Turn in tapes into the inner part of the openings on the farther edge. Fold from the collar and the bottom in *almost* to the center. By leaving 1 inch in the middle the folds lie flatter. By applying great firmness and long, steady strokes even linen that is rough dried may be made quite beautiful. A nurse's hands ought to be as good as a mangle. All these articles should be laundry mangled, but binders are

Fig. 41.

ironed. However, the laundresses do not *fold* for the sterilizing. The method of folding should be uniform throughout the hospital. If large sheets and blankets are folded in and in, they present a handsome appearance, since it hides any dissimilarity in stripes, while things of varying sizes that *have* to be used for the *same purpose* can be approximated to look the same, but laparotomy sheets and gowns must be folded in their assorted sizes to be selected quickly.

There should be a large stock of bags in the workroom

for dressings, both sterile and unsterile, ward, reserve, and operating-room supplies. These may be of stout unbleached muslin, carefully stencilled and very frequently laundered.

Blankets.—The top stretcher blankets should be crimson, being much more cheerful and preventing any sight of blood. They should be of wool only, and long enough to reach from the crown of the head to the sole of the foot. When a nurse is preparing a stretcher, if her patient is very tall she should lay an extra blanket from the center down to have enough for covering him. In every case the blankets should be laid on the stretcher first, then the binder, then the patient, then the lower blankets are brought up over him in every direction, particularly down around the shoulders and up over the feet, then new blankets over all. It is wrong to weight a patient down with many cotton "blankets?" because they are worse than useless. A couple of all wool blankets contain more heat than six cotton ones; but they should be of a suitable color, fawn or red, and protected very carefully from dirt, so as not to be in the laundry all the time. There should always be some kept in the blanket warmer, together with gowns and stockings. When requiring washing they should be first looked over by the supervisor and marked with a slip signed by her. The laundress should hold up all blankets not so marked. This makes the nurses careful about handling woolen goods recklessly. Small woolen masks, etc., should be boiled to prevent the spread of disease.

Stains must be removed before linen is sent to be washed. If so, the furtive attempts to use bleaches are headed off and the pupils trained in good housekeeping. Iodin is removed by alcohol or ammonia. Rust on metal is removed by Sapolio, on enamel by a weak solution of oxalic acid or Sapolio, and on white goods by (1) cream of tartar paste and sunshine or (2) lemon-juice and salt. Vaselin and other greases disappear with the application of ether, but it is very expensive, and the spots should not

be made in the first place. Bichlorid makes a gray stain, removable only by Javelle water or Labarraque's solution, the latter being diluted 1 to 6.

Labarraque's Solution.—Sodium carbonate (washing soda), 10 parts; chlorid of lime, 8 parts; water, 100 parts.

Linen for Isolated Cases or Dirty Dressings.—*Large* old linen ends can be folded and sterilized as towels for isolation or dressings that stain. This saves waiting for the long period of disinfecting. Do not send good operating-room linen out of the main room for two reasons: (1) It takes a long time to get it back; (2) by some mishap it may not be disinfected, and, coming to that common center, redistribute contagion all through the hospital. *Small* pieces should be squared off and folded for dressings for burns, for which there is nothing better. Gauze must not be put on a burn. It allows the ointments to pass through, then when removed it tears off the new granulations.

Measures.—A special section must be kept in the book of measures and patterns as to the sizes and lengths and materials for surgeons' *suits*, to be sent to the tailoring firms from whom they are ordered. No man wants to wear trousers made by the ladies' auxiliary. The suits should all come from a well-known hospital outfitter, thus saving time and money. The addresses of firms, samples of goods, shrunken and unshrunken, and the cost must be carefully entered. It is the head nurse's duty to call the nurses' attention to all these details in regard to the care of goods and devotion to the needs of the surgeons; to train them for holding similar responsible positions. Goods should be ordered about twice a year to form a large enough supply and to save the payment of too frequent freight bills. A strong plea is made herein for the nurses' comfort, so as to produce efficiency and content. Their gowns should be of assorted sizes and with well-fitting neck and sleeves, so as to fit all statures. A sloppy gown is not aseptic.

CHAPTER XVII

BUYING FOR THE OPERATING ROOM

Things not to buy are most important in a hospital or private home. Nothing should be bought just because it is inexpensive. It may never be needed. Nothing should be bought at the request of only one person; the virtues of the article must be demonstrated to the approval of all. Articles for the operating room should not be out of proportion to those of the rest of the hospital, whether it be ward, dining-room, or laundry, either in number, quality, or cost. Glaring colors, fads in styles, and designs of towelling that are not continuously uniform, so as to be known always instantly by sight as "O. R.," must not be purchased. Cheaply made goods have inferior dyes, and these, in turn, not being fast, ruin more valuable garments; for example, a whole set of doctors' suits, trousers, and jackets were made pink by the colors running in some cheap new towels in one metropolitan hospital. All purchases should be made by or at the will and choice of the committee on surgical affairs. Time should be taken by the forelock, and samples tried out long before the actual need to purchase.

These various difficulties can rarely be well met by one person. The superintendent, not actually engaged in nursing, does not *know* how certain goods operate. The operating-room nurse knows where they fail, but has not time to weigh, count threads, meet several salesmen on one class of goods, or write for samples and price lists. A "buyer," so-called, cannot buy on his own first-hand information. He must collect statistics from the house and from his own bills to satisfy an exacting superintendent. In most cases the buyer is so busy

justifying his own existence that he puts in an inferior class of goods or too small a quantity, to the hampering and unhappiness of the workers. Then he cheerfully asks for an increase of salary, to utilize the margin he made, where it can do the greatest good to the greatest possible number—Number One.

For all hospitals the simplest solution for the problem of buying is to become a member of that ingenious purchasing body, reaching from America to China, and capable of buying anything from drinking straws to dictaphones, called the **Hospital Bureau of Standards and Supplies,** which is a club consisting of representatives from the largest and best equipped charitable institutions who have joined, with a fair membership fee, to support the actual buyers on salary, and who can then not only secure goods at a big discount from the wholesale firms, but have no anxiety about selection or delivery. They place their orders at the head office of the association, whose buyers at once send what they wish from the supply houses of the wholesale dealers with whom this bureau has fixed yearly agreements relating to that kind of goods. It is really a very extensive mail-order business. But it is not conducted for the profit of one individual. Hospitals are not *money making* concerns. These buyers must weigh all goods, taste all tea, coffee, sugar, etc., count the threads per inch in gauze or wool with a magnifying glass if necessary, inspect cotton under the microscope, test the joints, valves, and bars in all plumbing apparatus, and only buy in houses whose goods meet the proper specifications. Goods are delivered very quickly and perfect satisfaction is guaranteed. This eliminates at least one salary in institutions of some size, and in the small hospital releases the superintendent to attend to the real superintending, of which buying should not be the only duty performed, otherwise certain basic principles must be observed in buying. Good goods produce efficiency in the care of the patient, but they must be strictly accounted for in placing, number, length of use,

and suitability. Buying a large quantity prevents expense in freight and causes a feeling of security, while the goods are not wearing out. The responsibility of caring for the stock in bulk must be placed on very few, not only to keep it in order, but to distribute it weekly. **Trade names** have been paid for twice over. "Hexamethylenamin" is bought very cheaply and used exactly as "urotropin" used to be; "thymol iodid" performs the same duties as "aristol," but is much cheaper. But a drug must not be bought and used this way until it *responds to tests correctly.* When buying certain articles on requisition from the operating room every feature must be described—*e. g.*, a jar for saline infusion must be graduated to 750 c.c., beginning *at the top* with *0 c.c.*, or, again, the length, style, material, eyes, stylet, bevelled tip of lumbar puncture needles must all be specified.

Whisky and **brandy** should be of the best quality and then kept under lock and key, whether in bulk or on the wards. Hospital whisky, as a rule, is a joke for its universal badness, unfit for both mouth and hypodermic medication.

Alcohol may be bought at a very low cost in its denatured state if the proper forms are executed. The president of the Board of Governors must sign a bond for $5000 for each barrel of alcohol kept in stock continuously by the institution as a guarantee that its use is confined to surgical, nursing, and pathologic ends. Were any one with evil intent to drink or otherwise depart from the legal uses of this liquid the president would have to forfeit this sum. An account, therefore, is kept of the use of all of it, and the care of it is left to a very conscientious official, who keeps it well safeguarded for the president's honor. When the liquid is being ordered an affidavit is taken by the superintendent and president to the effect that its use has been honest. For use following carbolic acid as a cautery, however, alcohol must be used in its *pure*, not denatured, state, on the stump of the appendix.

As to catgut, if the committee on surgical affairs were to visit and make comparisons of the various plants or laboratories where it is made wholesale they would become impressed with the folly of trying to do it themselves and the justness of the prices imposed. Possibly they could also detect differences between the materials and preparation of these various firms such as would warrant the difference in prices; at any rate, in these days of keen competition, when every manufacturer knows the secrets, initial cost, and overhead expenses of his rivals, it cannot be disputed that when there is five cents' reduction in the price there is five cents' reduction in the value. It is not necessary to pay only for a name, but when a name means confidence and merit it is wise to procure the best. Surgeons who thoroughly identify themselves with the highest interests of a hospital are economic of catgut. Their sutures are uniform for certain purposes. It is then easy to buy various lengths of catgut, done up in separate tubes for various purposes.

Emergency Orders.—In a crisis that *could not be foreseen* one is justified in ordering by messenger, special delivery, parcel post, or express; but for all that can be foreseen, freight is suitable and cheap, boat transportation being again less expensive than the railroads.

Important supplies that concern the actual knack or handicraft of a surgeon should be bought by the committee on instruments with grave deliberation, not by the superintendent of nurses or the office, who have never fitted them to the hollow of their hand for hours in the greatest crisis of a patient's life.

CHAPTER XVIII

MINOR WORK IN THE OPERATING ROOM OR BASED ON ITS TECHNIC

I. INTRAVENOUS INFUSION

Intravenous infusions usually strike terror into the heart of a new nurse because she attributes the shocked expression worn by the staff on account of the patient's danger to some frightfulness in the treatment itself. Then she grows nervous and makes mistakes. One should be glad that such wonderful results can be accomplished by so simple a thing. But the same set of people never meet a second time to give an infusion, and the nurse, being the one that "belongs," must know her part thoroughly and do her duty. When the patient is in shock from hemorrhage or from amputation of some organ or limb, infusion is resorted to as a stimulant, but properly never *during* a hemorrhage, only after the vessels are securely tied off and the bleeding checked. Normal saline, containing just as much salt as the blood, is thrown into the vein to give the heart enough fluid to pump on until the patient can manufacture more blood. It is like the process of priming a pump that has gone dry, whose valves resemble those in the heart. The infusion is given in a vein to produce the quickest effect on the heart, and it is the arm that is usually chosen, being nearest the heart. The technic is universally the same, though the instruments may vary somewhat. A tourniquet is put on the upper third of the humerus between the heart and the seat of incision. Nurses should get the habit, when bathing patients, of observing the size, color, and position of the superficial vessels. As a rule, the

median basilic vein is selected in the left arm, since the operator is proceeding with the major work on the right. If for any reason it is not possible to use the arm, the ankle is resorted to, where the veins stand out prominently over the malleoli. In a patient's room either arm may be chosen, depending on the size of the veins. The tourniquet causes dilatation of the superficial vessels, but must not be so tight that it can cut off the deeper arterial circulation. If the arterial supply were cut off the lower arm would be pale and bloodless. It is a good condition, therefore, to find the arm darkened with an excess of venous blood, which cannot get back to be oxygenated in the lungs, all the portion between the tourniquet and the point of incision being now very coagulable, must bleed back before the saline is injected, which, otherwise, would drive that thick impure mass back toward the heart, possibly causing a plugging of the circulation by a clot. Such a clot is called a *thrombus*, and the condition of being so plugged is called *thrombosis*. A few snug turns of an Esmarch bandage are sufficient. A long rubber tube about as thick as a rectal tube, with its ends crossed over the vein and held secure by an artery clamp, makes a good hurry-up tourniquet. A muslin bandage may suffice.

The area to be incised is painted with iodin and sterile towels laid above and below. The doctor performing the infusion should wear cap and gown, since bad effects may occur from the dropping of dandruff in such a wound.

The skin is incised about 1 inch by a scalpel. With the blunt end and a thumb forceps the sheath of the vein is dissected away and the swollen blue vessel exposed. A grooved director is run under it to keep it elevated, then two catgut ligatures, one above and one below the coming incision, each tied loosely once. Then the *distal* ligature (measuring from the heart) is tied tightly to prevent any more venous blood from welling out into the wound. All the blood that previously travelled back

by way of that vessel to the heart must now forever take one of the side channels to reach its destination. (See Anastomosis in any text-book on anatomy in the chapter on Circulation of the Blood.) The vein is now incised, and by force of gravity the thick dark mass above drips back through the canula (Fig. 42), now inserted to keep the vein open, attached to the fine rubber tubing of the set, fitting it exactly. The tourniquet is now removed and a little more blood allowed to drip back. To the irrigating jar is joined a sterile tube with a clip or cut-off and a glass connecting tube, larger at one end to fit it, and smaller at the other to fit that tube which fits the canula. The nurse releases the saline, and the doctor, not depending on her report of the temperature, though not denying it, lets some run over his arm or hand, then, all noting the point at which it stands in the jar, the saline is injected into the vein by connecting all the apparatus. Irrigators must all be graduated. Some number 0 at the top, much the better way. If ordering mention this. If 50 c.c. were run off before the patient begins to receive any, and at 750 c.c. we stop because he shows sufficient reaction, he received only 750 − 50 c.c. or 700 c.c. It is also better to graduate in cubic centimeters, since the small amounts can be meticulously gauged. Some jars are built like a bottle with a spout at the bottom; others are a modified inverted cone, tapering to fit the lumen of an ordinary tube. These give general satisfaction, and it is useless to cover them at the top. They give a very steady flow on account of the generous surface, and the speed can be controlled below by slight pressure on the tube to prevent dilatation of the heart. The temptation always

Fig. 42.—Infusion canula with stopcock (Bellevue Hospital).

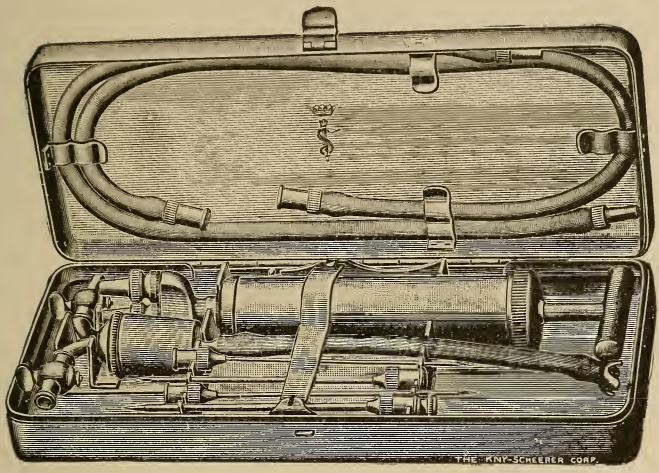


Fig. 43.—Potain's aspirator, 60 c.c.—metal barrel and metal piston, three needles, one stop-cock, one trocar, and tubing.

Fig. 44.—Bottle for Potain's aspirator, 500 c.c.

is to hurry. That is a mistake. The only cause for hurry is the patient's bad condition or the cooling of the saline. The temperature of the solution is a mooted one. It is usually started at 120° F. to allow for slow delivery, cooling while in the long tube; but it must be delivered at 98.6° to 100° F., practically at body heat, *not cooler;* therefore we need two thermometers, one to test the solution in the tank and one to test it just before it enters the vein. A bath thermometer, stripped of its wooden casing and kept in an antiseptic solution, then *rinsed in sterile water* and held by forceps, may be used above. An "infusion thermometer" consists of a large glass connecting tube with a thermometer placed stationary inside of it. It is of equal lumen at the ends, and we simply cut the long tube from the jar and slip it in near the lower end. It registers from 90° to 104° F., and it is imperative to have it in all hypodermoclysis, infusion, and Murphy drip sets. If the solution runs too cool, a small amount of hotter saline is cautiously added, watching the upper thermometer; about 1 ounce at a time, since it goes slowly down the tube, but runs up the mercury fast when it gets there. Cool should be added similarly when the other is too hot. The tube should be pinched low down until these temperatures are adjusted. Hurry and excitement are sinful at such a time, and are not any excuse for administering too cold or too hot a solution. The amounts added must be kept in mind. If all is going well, and the patient will take more than the jar holds, a new amount of the right temperature is carried in a sterile pitcher and poured in without touching the latter to the jar and covered with a sterile towel while carrying. When about to pour it in the long tube is pinched below the infusion thermometer, and the amount in the jar noted. Say it stands at 740 c.c. When we know more will be needed, it must be added before the old solution gets below the lowest mark—(*a*) so that we can estimate it; (*b*) so that *no air* will get into the vein. When filling any glass container for the first time cool liquids

should be poured in first, then the hot is so tempered that it cannot break the glass. If then we fill it up to 0 c.c., we have added 740 c.c. If it was standing at 750 c.c. when we stopped, and we filled it to 150 c.c., then we added only 750 − 150 c.c. = 600 c.c. to the original amount.

The bottom of the irrigating jar should *not be more than one foot above* the patient's body, and everyone else concerned must be patient, too, while it runs evenly. The sterile tape boiled with the jar hangs it to the stand. The towels, iodin, and set should be brought first, so that by the time the incision is made the jar of saline is in position. The patient's pulse, respiration, color, fingertips, skin, and other features must be closely scrutinized, and when they are all again normal the treatment is stopped. The proximal ligature has already one loose knot in it, which is now tightened over the canula, which is withdrawn, and the saline cut off, then the ligature is tightened, knotted, and the wound sponged out. A couple of sutures with a straight or curved Hagedorn needle close the wound with plain catgut. It is dusted with aristol, covered with folded gauze, and snugly bandaged with gauze, not so as to interfere with the movement of the arm. Mouse-tooth forceps must not be used on the vein. The artery clamp of the set will stop any small bleeders. The probe may help in locating the vein.

It is most expedient to make saline up in triple strength, that is, 3 drams to 1 pint, for this very purpose, so that the very hot may be diluted by twice the amount of cold sterile water. To make it triple strength saves space and time, but it must be marked so, and everyone must have that understanding also. Nurses from the wards rushing up for supplies should not help themselves. Saline is given out by a reliable member of the pupil staff. At night, when all supplies are locked away, only the night supervisor or some pupil who "has had operating-room" should have access to the stock, leaving a note on the spindle saying where it went and what its use.

Infusion Set.

Irrigating jar with tubing and tape.
Cut-off.
Dairy thermometer.
Infusion thermometer.
Glass connecting tube.
Canula (silver only).
Fine rubber tubing (never cut a catheter).
Scalpel with free curved edge.
Thumb forceps.
Mouse-tooth forceps.
Artery clamp.
Probe.
Grooved director.
Curved scissors.
Hagedorn needle, curved or straight.
Plain catgut No. 1.
Infusion stand.
Table for the arm.
Sterile towels.
Flat gauze and sponges.
Bandage, 2-inch gauze.
Tourniquet.
Aristol.
Saline flasks, asbestos mat.
Hot and cold water (pitcher).
Iodin, 2.5 per cent. ($\frac{1}{4}$ tincture, $\frac{3}{4}$ pure alcohol).
Sponge pail.

To Put Up the Infusion Set.—The set should be kept in readiness in sterile covers on a tray inside a locked cupboard. It should be opened at regular intervals to see that everything is in it and rustless, then resterilized. The very best of instruments should be used. Wash after using, scrub with Bon Ami, and boil the irrigator, three tubes, cut-off, canula, scissors, clamp, forceps, probe, grooved director, needles, glass connecting tube, but soak in bichlorid (1 : 1000) the catgut and two thermometers, and in carbolic acid and alcohol the scalpel. Lift the tray

out of the boiler to drain the boiled articles, dry, and handle them with sterile forceps. On a clean table lay sterile towels as a cover. Above these lay sterile towels folded double laterally to be used to put up the articles. Keeping the hands under another sterile towel, and lifting each article by a forceps, wipe it thoroughly dry and lay it in its towel cover. Similarly do with the catgut knife and thermometers, rinsing them under the sterile water tap. In one package place the irrigator with its tape and cut-off, two pieces of large tubing, dairy and infusion thermometers, so that if need be it may be used to give a hypodermoclysis. For this purpose we do up separately after that treatment a glass **Y**, two fine pieces of tubing, and the hypodermoclysis needles (a pair with stylets), sterile or simply clean and ready for boiling, because they can be easily boiled in time. Each package should be fastened securely with buried pins and labelled with adhesive or gummed labels. The nurse who does them up should write her name on the outside of the package. Dry sterilization is not so dry that it is good for instruments. It rusts them. These bundles must always be kept in the same place.

In the second package put the canula, scissors, clamp, mouse-tooth and thumb forceps, probe, grooved director, glass connecting tube, fine rubber tubing, scalpel, needles, and catgut, which may be used also for *phlebotomy*.

Infusions must not go wrong. Hospitals have disgraceful traditions about infusion sets, aspirators, and cauteries, so that it has come about that the doctors are surprised if they go well. Any tiny hospital should have at the very least two infusion sets complete—(*a*) in case two patients need it at once; (*b*) in case parts of a set are lost or are being renickelled; (*c*) in case a patient requiring it is in isolation. A list of what belongs to any set should be found in the house-book of rules and pasted on the tray where the set is kept.

II. HYPODERMOCLYSIS

For all these treatments put the bedside table near the foot of the bed, but on the right-hand side.

Required:

(*a*) Two needles with stylets, all in good condition (dried over an alcohol flame, then lubricated, assorted sizes); 2 pieces of fine rubber tubing to fit them; 1 glass **Y**. (Kept together at all times.)

(*b*) One sponge-holder (from the ward) for iodin.

(*c*) Jar or irrigator for saline with tape loop; long rubber tube containing infusion thermometer; cut-off; dairy thermometer. (Kept in one set as for infusion.)

(*d*) Stand, collodion, iodin in 2-ounce glass, towels, cotton, pus basin, sponge pail (on floor), sponges.

The saline is prepared as for infusion. If triple strength, it is diluted with hot and cold sterile water. The hot flasks, if normal, must not be set on a glass table without a thick covering, to prevent cracking the table.

Set the table with sterile towels lifted out of their cover by the ward forceps (in lysol). Lift the boiled articles of (*a*) out of their basin at the bedside and lay on the towels. Lift out the thermometer, sponges, cotton, etc., and hang up the jar, holding the end of the tube with forceps on the table so that it will not become unsterile. Place the iodin at one edge so that it will not be in the way after the start is made or contaminate the rest. Place the sponge pail and pus basin so as to catch the overflow while the needles may be adjusted. When pouring into the irrigator do not touch the two containers together. Pour a little cold solution *first* always, so as to prevent the hot from cracking the glass. While the doctor, who has scrubbed up, is fitting the needles, withdrawing the stylets that are always to be boiled in them, adjusting the glass **Y** and the tubing, the nurse prepares the patient. The arms are placed above the head, the gown drawn up to the chin and tucked tightly under the shoulders, the face shaded by a towel if conscious, and sterile towels laid across the chest and abdomen above and below the nipples

(breasts). The doctor applies iodin to both surfaces of injection (the base of the breasts) with sponge on holder. The nurse operates the cut-off so that the solution runs until the temperature below is 100° to 102° F., then the cut-off is tightened and the needles inserted while standing full. Then the cut-off is opened, and the doctor gently massages the solution back into the farther tissues and watches the temperature, the patient's appearance, etc. The nurse notes the amounts, as in infusion, replenishes it when it runs low, and tests the temperature above, also taking the patient's pulse from time to time. One wound is dressed with collodion on cotton before withdrawing the second needle, so that none runs out due to internal pressure. Usually the amount is 1000 to 1500 c.c. That can be very well borne. The patient is then made comfortable and all things cleared away.

These articles must be immediately washed, boiled, and sent to the operating room for final sterilization. Even when that process is only boiling, putting up these packages must be done by an operating-room nurse, and she must see that the ward returned everything O. K.

Irrigating jars look very clean if dry sterilized, but, on the other hand, that rots their tubing. If boiled in a towel no scum should adhere.

Use small needles for children.

INJECTION OF BLOOD-SERUM

In certain conditions of (1) hemorrhages of the newborn, (2) traumatic hemorrhages, (3) hemorrhages after operations, and (4) purpura hemorrhagica (early) the loss to the general circulation is sometimes restored by the injection of blood-serum. As in transfusion, the blood of a very near relative by consanguinity—that is, one's own parent or a descendant of the same parents as one's self—must be obtained. For a newborn infant the father, and for a newly delivered woman her father, mother, brother, or sister. The blood from the donor is withdrawn, set in the ice-box in a sterile open-mouthed vessel,

but covered, to permit taking out the clots easily after they form, yet let nothing unclean drop in. In twenty-four hours, when the coagulable matter has collected into one clot, the serum, now absolutely clear and slightly heated to body temperature by standing in tepid water, is injected by a large ground-glass syringe in doses of 15 to 25 c.c. in the patient's buttocks. As a rule, the second treatment is the last. In all these cases the donor shows marked effects: (*a*) Bluish patches under the eyes, which are sunken; (*b*) general lassitude; (*c*) great disturbance of the heat centers, heat sensations rapidly and irregularly alternating with cold, *showing* that he must be put to bed until his circulation is readjusted. The injection is performed with strict asepsis.

TRANSFUSION

Transfusion means transferring blood directly and while yet warm from the body of a healthy donor to the body of a patient. It must be distinguished from infusion in these ways:

(*a*) In infusion the fluid is saline.

(*b*) In infusion there is only one person treated.

(*c*) In infusion there are no tests for coagulation, etc., required. It is indicated, according to the best authors, in the following cases: gastric and duodenal ulcer, typhoid, ectopic pregnancy, tonsillectomy followed by hemorrhage, purpura hemorrhagica (advanced), hemophilia, carbon monoxid poisoning.

The blood must be tested by a skilled pathologist to determine the degree of agglutination, which should correspond in the donor and the patient. The donor should preferably be a blood relation, that is, the father, mother, uncle, sister, brother, son, or daughter of the patient. If the blood of a cat were injected into a human being the latter would possibly die after the first and positively after the second injection. Vice versa, if a man's blood were injected into a cat, the latter would die of blood destruction or hemolysis.

The strictest asepsis is required. The two persons lie parallel on two operating-tables of equal height. The right arm of the patient and the left arm of the donor, or vice versa, are cleansed and then wrapped in sterile towels, laid on a table of the same height, midway between. At the foot stands a similar table for the "scrubbed nurse," who, during the operation, constantly washes the syringes in water at about 100° F. If upon careful inspection it is found impossible to use the median basilic vein, a more extended search is made for suitable vessels, which will necessitate a different placing of the persons.

The operator punctures the patient's arm with the common salvarsan needle, lubricated inside with sterile liquid albolene, then the donor's arm with a second. The venous blood ascends the arm and the needle taps an ascending stream, but the blood, flowing back, bleeds only a little, and it is merely sufficient to fill the needle and expel all air before the syringe is fitted on.

On the arm of the donor the first syringe is filled. These are 20 c.c. in content, of ground glass, the best to be had, working beautifully. About six syringes should be kept constantly on the go to expedite the process. Being reasonably healthy and at least mildly excited, the donor has an increased blood-pressure which may fill the syringe by pushing back the piston without aspiration.

The operator lays down the full syringe, swiftly raises another, and lets it fill. The moment he relinquishes one full syringe the assistant fits it to the needle in the patient's arm, injecting all but about $\frac{1}{4}$ dram, which he expels to show that he did not drive air into the vein. A nurse keeps count of the number of syringes filled. The operation never ceases until enough is injected to meet the demands—1 pint, or twenty-five 20-c.c. syringes, can be injected in nine minutes.

Another assistant is required to pass the syringes to and from the nurse continuously.

The needles are withdrawn and the slight wounds dressed with cotton and collodion. There are no incisions,

no scalpels, no great chances for infection. The patient's color, lips, nails, pulse, and respiration should be *very* closely watched during this delicate but brilliantly showy performance.

PHLEBOTOMY, VENESECTION, BLOOD-LETTING

The doctor used to be called "the leech" at a time when all disease was supposed to be due to having too much blood, and living leeches sucked out the overplus. Later the physician used a scalpel and saw how much he "let." But phlebotomy is now rather rare, and only in conjunction with an accurate diagnosis made by the assistance of a sphygmomanometer. In the "open" method a wound is made and the vessel then tied off twice, as in intravenous infusion. Required:

(1) The instruments of the infusion set, scalpel, forceps, catgut, etc.

(2) Pus basin to catch the flow of blood, graduate to determine the amount, and pail.

(3) Large rubber to protect the bed, sterile towels, sponges, etc.

Set the table as for infusion. Do not let the patient see the red stains and cause him needless alarm. Watch the force of his pulse-beat. Do not allow any blood-stream to escape unnoticed and uncalculated, thereby depleting the patient too greatly.

In the "closed" method, to obtain only a very small amount, as for blood cultures, which must be conducted in an aseptic manner, a needle is employed to puncture the vein, but there is a special technic arranged by pathologists for cleansing the skin, disinfecting instruments and containers, etc., which should be posted in each hospital and arranged for by the ward nurses to suit his convenience. *His* desire for asepsis is to prevent any outside germs from entering the blood, lest he attribute them to the patient himself. Our desire for asepsis is to prevent any bacteria from getting into the patient.

LUMBAR PUNCTURE

This is employed as a test for cerebrospinal and tubercular meningitis, and must be conducted with most aseptic precautions for two reasons: (*a*) Not to infect the patient; (*b*) to see his spinal fluid as it really is.

Required:

(1) Iodin, cotton, collodion, sterile 2-ounce glass, forceps.

(2) Lumbar puncture needles, assorted sizes, special design, with bevelled stylet and an eye ½ inch above the point.

(3) Sterile glass graduate to contain the first flow of fluid (small).

(4) Sterile glass graduate to send whole amount to the laboratory, if necessary, and to estimate it, this fluid being sought by the big laboratories to manufacture from it antimeningitic serum.

(5) Rubber sheet, towels, pus basin, sponges, etc.

The patient's knees and chin are brought together so as to bow out the lumbar vertebræ. The area is painted with iodin, then, the landmarks being carefully taken, the needle is inserted, the smallest glass held beneath it, and the stylet withdrawn. Ethyl chlorid destroys the landmarks by freezing.

To inject antimeningitic serum, required:

(1) The serum, standing in a tepid solution of bichlorid of mercury, 1 : 3000, at a temperature of 100° F. It must be allowed to run in at body temperature in such a vital spot.

(2) Special glass and tube, as for spinal anesthesia. This glass is like the outside of a large glass syringe, open at both ends, the lower tapering and the whole graduated. It contains 20 c.c. and fits a fine piece of rubber tubing which, in turn, fits the needle. No air is allowed to enter and no force is employed. The cord is not aspirated, just *tapped—i. e.*, the fluid is let run out by gravity. Similarly it is let run in by gravity, *never propelled by a*

piston. If the serum were used cold it would cause a subnormal temperature and additional discomfort to the patient.

SPINAL ANESTHESIA

Spinal anesthesia is an exact duplicate of the above, except that the fluid introduced (without any force) is a chemical substance, innocuous to heart and kidneys in the normal individual, while chloroform is injurious to the one and ether to the other.

In addition to the articles above named is found a small sterile glass, into which the ampoules of stovain are first broken and whence it is poured into the special graduated tube for introduction into the cord.

The patient is stripped to the waist of his loose operating-room garb, and sits on the operating-table in the main room, leaning forward with his arms over the shoulders of a shorter person standing close to him so as to bow out his back at the lumbar region. The area is cleansed with iodin and alcohol, then the spinal fluid is drawn off. It is not required for examination or measurement. The tube for stovain is connected and held very low, to show the presence of spinal fluid, to which the stovain is now added, so as not to introduce any air, then raised to a normal position. The patient's arms are drawn above the head and the eyes covered. Then his sensation is tested, from the toes up to the point selected for the wound. When complete anesthesia up to the desired point is obtained, he is laid on the table and the operation begun. Some patients have died following this anesthetic and others have died from the effects of the operation, while it has for still others been ideal.

ARTIFICIAL RESPIRATION

This is positively the duty of the physician, but in case he is not to be found, or has been incapacitated in any way, a nurse should know how to perform it, just as it is done by the Life Saving Corps or by gymnasium instructors.

The Sylvester method is very satisfactory because it can be comprehended by others than physicians.

General Rules:

I. Never give up hope; keep up the treatment for at least ninety minutes.

II. Consider the patient *alive* at the start.

III. Carry out the treatment where the patient is.

IV. See that there is no obstruction in the nose or throat.

V. Do not get excited and do not give too rapidly.

VI. Elevate the patient's shoulders about 4 inches.

VII. Clamp the tongue, and let another assistant draw it forward with each expiration, and not let it drop back, ever so slightly, with each inspiration, impeding it.

VIII. Stand or kneel far enough above the patient to have good purchase when pressing downward behind his head.

IX. Make the (inward and outward) respirations for an adult 16 to the minute—that is, $3\frac{3}{4}$ seconds each—two seconds for the inspiration and almost two seconds for the expiration.

X. (*a*) Grasp him by the forearms, half-way between elbows and wrists, and draw up his arms out and over his head steadily until the hands touch the table, floor, or ground behind his head. Hold them there for two seconds. This motion expands the chest by drawing up the ribs; air may enter. Two seconds' halt allows it plenty of time to fill the lungs completely. (*b*) Reverse that movement. Carry the arms downward until they rest against the sides of the chest, bringing the forearms in a little on top, pressing them firmly downward and inward against the chest for one second. Listen for the sound of air entering and leaving. If not heard, the work has been done incorrectly.

CHAPTER XIX

PREPARATIONS BY THE NURSE IN ORTHOPEDIC SURGERY

Open work on bones requires the most assiduous efforts at asepsis, but this has been discussed briefly elsewhere. Closed operations, or the breaking, straightening, and overcorrection of bone, show no open wound. But poor or improperly prepared materials hamper the orthopedic surgeon very greatly, much more than the dressings for a laparotomy could do, if clumsy or unfamiliar. Plaster work requires in a surgeon a natural aptitude or knack, but the most wonderful knack cannot make a good cast out of poor crinoline, inferior plaster, or badly soaked bandages. Making plaster bandages is a regular part of the operating-room training, and must not be relegated to an orderly.

Definitions.—Surgical Diagnosis.—For deformities certain technical terms are used:

Congenital dislocation of the hip. A deformity existing from birth, the head of the femur being lodged outside the acetabulum, with the formation of powerful adhesions. Frequently this occurs in both sides.

Funnel breast. A depression of the chest walls at the sternum resembling the bowl of a funnel. It is like a shoemaker's chest, only it may occur at any point. It is corrected by very strenuous exercises, not by operation, but must be done early to abort any hereditary predisposition to tuberculosis by increasing the child's lung capacity.

Genu valgum. Inward curving of the knee, knock-knee, opposite of bow-legs.

Genu varum. Splay foot; synonym of *talipes valgus*, bow-legged; inner part of the sole rests on the ground.

The preceding are neuter nouns and adjectives, therefore the latter end in *um*.

Hallux valgus. Displacement of the great toe toward the other toes.

Hallux varus. Disposal of the great toe away from the other toes—displacement.

These are masculine, therefore ending in *us*.

Hip disease. Usually tuberculous and in the young. It lodges in the head of the femur, in the acetabulum, or in the synovial membrane and proper structures of the hip-joint. The early symptoms are shuffling gait, pain

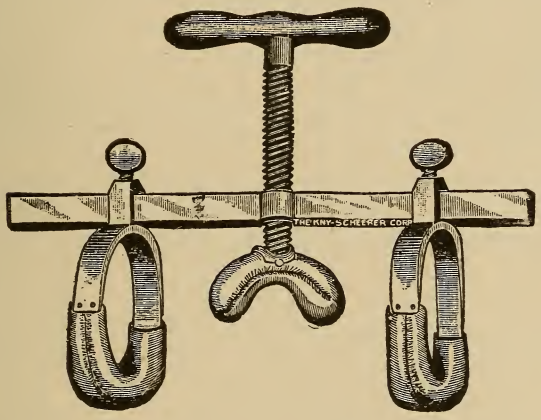


Fig. 45.—Osteoclast (Phelps' modification of Grattan's).

on the inner side of the knee, pain in the hip on jarring the heel, deformity, shortening of the limb, suppuration, and formation of fistulæ.

Kyphosis. Angular curvature of the spine, the prominence extending posteriorly.

Lordosis. Curvature such that the convexity points forward.

Osteoclast. Instrument to break bones to correct deformity (Fig. 45). Do not confuse with the term "osteoblast," which means a cell found in the formation of bony tissue in the embryo.

Pott's disease. Curvature of the spine with a posterior projection due to spondylitis or inflammation of a vertebra. It is usually tuberculous. It may be high or low. When high, it is more quickly discoverable; when low, it shows up usually as a psoas abscess, the inflamed area breaking down into pus which migrates downward along certain muscles toward the inguinal region. The symptoms of Potts' disease are stiffness of the spinal column, pain on motion, tenderness on pressure, undue prominence of one or more spines, and a particularly wistful facial expression.

Scoliosis. Lateral curvature of the spine, bending of the column to right or left.

Talipes. Club-foot.

Talipes equinus. The heel is elevated, and the weight is all thrown on the anterior portion of the foot, like a horse's foot.

Talipes planus. Flat-foot.

Talipes valgus. Foot turned outward.

Talipes varus. Foot turned inward.

APPARATUS

A **Bradford frame** may have to be constructed quickly to provide horizontal fixation in cases of children suffering from fractures or from tuberculosis of the spine. The frame itself is of bent gas-piping, from $\frac{5}{8}$ to $\frac{1}{4}$ inch thick, in a perfect oblong, 1 inch wider than the patient's body at his hips, and 6 inches longer than his full stature; that is, in the proportion of about 1 to 5. It is covered by a piece of stout canvas twice its width, and laced down the back on the center of the side away from the child with eyelets and stout laces. It is arranged to leave an opening for the bed-pan, which, however, does not interfere with the tautness longitudinally, which is taken care of by two pairs of webbing straps at the head, and again at the foot. This frame is constructed to obliterate pain, and the child can be very comfortably carried on it. In spinal cases he may lie and kick all he pleases if his feet

are warmly clad. As to bodily clothing, otherwise, when he is *applied* to the frame, he wears only undershirt and diaper. His warm dress is put on, last of all, over the jacket of the frame. Two thick pads of felt are sewed on the canvas, each 7 inches long and $\frac{3}{4}$ inch thick, to protect the hump from pressure and to increase the leverage of the apparatus. Mangle felt is excellent for orthopedic purposes. There should be a small square of rubber covered with muslin at the region of the buttocks. To make the frame more effectual, it may be bandaged with strong muslin bandages, with edges turned in, before applying the laced canvas top. This frame is gradually bent, under the kyphosis, to curve upward *from the bed to the hump*, the ends resting on the bed. This obliterates the hump in time. Much orthopedic work with braces, frames, and suspension apparatus is really a daily "operation" by the nurse. The child is taken off the frame daily, handled painlessly, bathed, rubbed with alcohol, and powdered. It is essential to have two canvas covers for each frame. To secure the patient to the frame an apron of canvas, covering the child's chest from the armpits to the hips, is provided, with three pairs of straps of webbing and buckles, fastening in the back on the under side, immobilizing his body. The fixation must occur in the region of the disease—*i. e.*, for lumbar disease a broad binder should be passed over the hips, and if there is psoas spasm, traction is usually employed.

Buck's extension (Fig. 46) consists of the following parts, all of which should be kept together in a set in a chest:

(1) Two strips of moleskin plaster, each 2 or 3 inches wide and extending from the seat of the fracture to the internal malleolus.

(2) An alcohol flame to melt the adhesive.

(3) Two pieces of webbing for each leg, to be stitched to the plasters at their ankle end, 2 or 3 inches wide and 6 inches long.

(4) Five other strips of moleskin, each $1\frac{1}{2}$ inches wide,

to encircle the leg, the knee, and the thigh, also to extend spirally from the malleoli around the leg and thigh to the seat of fracture.

(5) Roller bandage of 3-inch muslin, with the edges turned in during application, then stitched in neat rows, to be kept in place.

(6) A curved or straight ham, or posterior, splint properly padded.

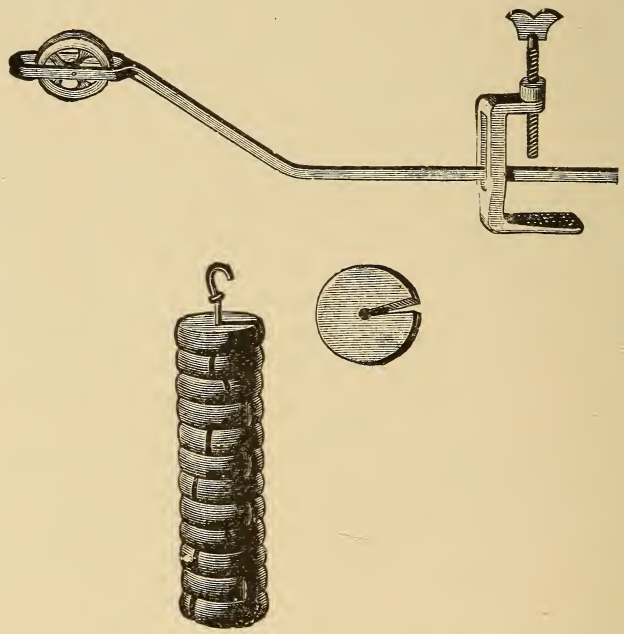


Fig. 46.—Apparatus for Buck's extension, with rope and weights.

(7) Three coäptation splints to surround the thigh.

(8) Six webbing straps with buckles or strips of bandage to be used as straps.

(9) Fresh sheets, pillowslips, or towels as pads.

(10) A straight abdominal binder for the pelvis.

(11) A long axillary or outside splint of wood, 4 inches wide, from the axilla extending 6 inches below the sole of the foot.

(12) To this is nailed a cross-piece 18 inches long, making a **T**.

(13) Two towels, soft and old, or $2\frac{1}{2}$ yards of flannelette (one-fourth the width) for a perineal strap.

(14) Safety-pins arranged with their points in a cake of Castile soap.

(15) A pulley, screwed into a broom-handle cut the right height or attached to a special iron bar (part of the set) that clamps in two places to the bed frame.

(16) A spreader, being a piece of wood 2 inches wide and a little longer than the width of the patient's foot, with a hole bored in the center for the cord, on which hang the weights for extension.

(17) A piece of clothes-line (cotton rope) 4 or 5 feet long.

(18) Two shock blocks to elevate the foot of the bed.

(19) Four sand-bags with white muslin slips, each 20 inches long and 6 inches wide.

(20) A square cradle, made of pine, fir, or cedar, to keep the weight off the limb.

(21) A soft, warm old blanket for the limb, lying closely over it.

(22) Cotton covered with gauze to stuff into corners (this prevents fluff from spreading through the bed).

(23) A fracture-board or a plain level old door, with holes bored through it to air the mattress on the under side.

(24) Needle, thread, thimble.

(25) Tape-measure.

(26) Weights, graduated and recorded as to amount, when used.

(27) Anesthesia set, vaselin, pus basin, towels, etc.

(28) A railroad (old-fashioned, but still in vogue)—a track of wood on which the leg glides smoothly.

Such a list as this, combining with the basic articles here enumerated any favorite materials of the operator, should be posted in the treatment room where this sort of work is done.

The **Lorenz operation for congenital dislocation of the hip,** consisting of bloodless reduction, retention, weight bearing.

For bloodless reduction no instruments are required but the surgeon's hands; a thick folded sheet beneath the patient's buttocks; a wedge of wood (for all but tiny children) about 5 inches long, 3 inches wide, and suitably padded to form a fulcrum under the head of the femur; a second sheet folded diagonally to make traction from the perineum, with the ends tied about a corner of the table.

If the reduction requires two sittings, a plaster spica is required for the first, and certainly after the last. The following special articles are to be provided:

(1) A close-fitting long stockinet shirt, one-half of which is cut and sewed to cover the limb as a drawer leg would do.

(2) This drawer is "threaded" with a long bandage, called the scratcher, which runs down as a loop inside the drawer and up outside the cast, to give the patient or nurse a means of rubbing the skin underneath when it itches.

(3) The hip or pelvic rest to elevate the body for all spica work.

(4) Sheet-wadding, with glazed surface preferably, or cotton in long rolled strips, 4 inches wide, to cover the pelvis and thigh thickly.

(5) A firm bandage of muslin for elasticity and compression (may be preceded by a fine smooth gauze bandage).

(6) The plaster spica, very thick and firm, consisting of a dozen or more ordinary plaster bandages, embracing the iliac crests, the buttocks, and the leg to, *but not over,* the knee-joint.

(7) Plaster scissors to cut away the edges; then they are everted.

(8) Stout thread with needle to sew the stockinet (when it is smoothly turned up over the edges) to itself.

(9) The stimulation tray with the anesthesia set, because many deaths occur from the violence of the rupture of these congenital adhesions under the anesthetic.

(10) A cork sole of $1\frac{1}{2}$ to 3 inches in thickness should be early ordered for the affected foot when walking begins in the third week.

Ordinary Plaster Bandages.—In hospitals where orthopedic surgery does not constitute a special branch of work there are at least many occasions when plaster casts must be applied. To make the bandages are required:

(1) A large flat tray.

(2) The best of crinoline, of a standard fineness and thickness, this being the foundation of the whole system.

(3) Excellent dental plaster of Paris.

(4) A spatula to apply the plaster to the crinoline, though most nurses prefer to go ahead with the bare hands.

(5) A tape-measure and stout scissors to measure, cut, and roll the crinoline in *5-yard lengths* of the usual widths —3, 4, 5, and 6 inches.

(6) Small round tin boxes, one for each bandage, lidded, or squares of blue tissue such as comes with cotton, to roll up each bandage separately, then laying them on their side in a large square tin box with lid, to be kept perfectly dry.

(7) A rubber apron and, if the skin is abraded or suffers from contact with irritating clays, thick rubber gloves.

(8) A solid stool and table with foot-rest.

The bandage must have all the plaster it can hold, and this must be evenly distributed throughout its whole length. It is set on the left-hand side, unrolled, filled with plaster, much lying under it on the tray, smoothed, and rolled up to keep it ship-shape on the right as one goes along. It must be rolled only about 75 per cent. tight—that is, fairly loose—so that water may circulate between the layers of plaster later. It is of vital moment to keep up the stock of plaster bandages. If on any one

day they run too low, they should be *replenished that same day* before the nurses go off duty.

For **putting on a cast** the following articles are required:

(1) Gown, rubber apron, and unsterile rubber gloves for the surgeon (also rubbers with high tops to cover his shoes, if he chooses).

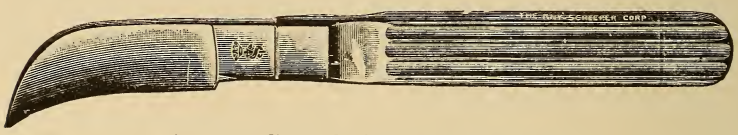


Fig. 47.—Curved plaster-of-Paris knife.

(2) Newspapers, rubber sheets, etc., to cover the floor.

(3) Ammonia, alcohol, or vinegar to soften the old cast or cleanse the hands.

(4) Special knife, saw, and shears for cutting casts (Figs. 47, 48, 49).

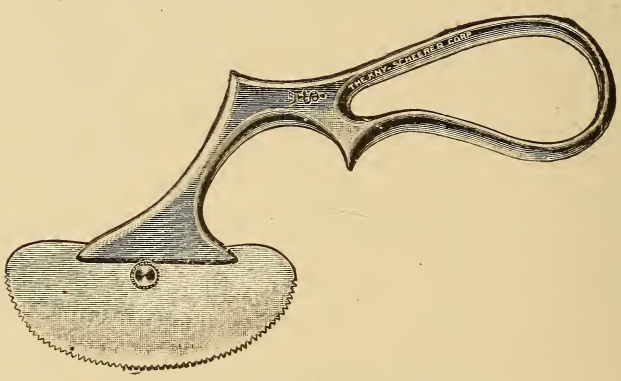


Fig. 48.—Saw for plaster-of-Paris cast.

(5) Stockinet, shirt, drawers, or stockings of cotton or Balbriggan to protect the body (the pupils should save all their cast-off white hose for this purpose, especially for arm cases); bandages of stockinet are good for any portions of the body not ordinarily clothed with knitted goods.

(6) Mangle felt in strips or squares, to pad or give elasticity with compression.

(7) Sheet-wadding, glazed, preferable to cotton, in many rolled strips, 4 inches by 1 yard.

(8) Cotton, alcohol, and powder to rub and pad all humps or edges, even after everting the stockinet cuffs.

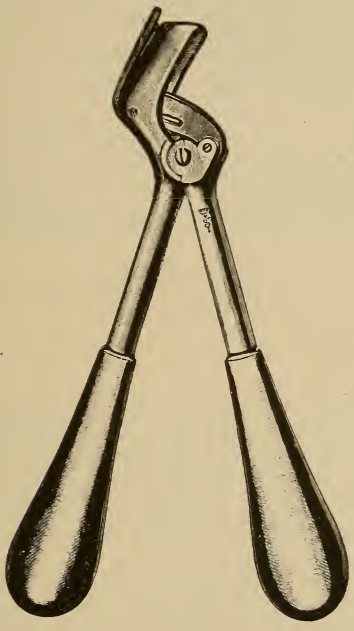


Fig. 49.—Plaster-of-Paris shears.

(9) Oiled silk, to form at the edges near the genitals a surface impervious to urine or stool.

(10) Hip rest of metal or wood (also convenient for the spica in hernia) if no orthopedic table is to be had.

(11) A large enamel basin, 8 inches deep, in which to set the bandages on end, with plenty of space for the water to submerge them plus the nurse's hands, without overflow.

(12) Water at the temperature of 100° F., kept so by adding hotter from time to time from a pitcher nearby; a bath thermometer.

(13) A solid table protected with rubber sheeting and an old cotton blanket.

(14) Old soft blankets on the patient; warm-water bottles, each with two covers not warmer than 110° F.; a burn through a cast, not being easily discovered, is apt to be very deep and lasting.

Special Instructions to the Nurse.—(1) Set the bandages on end, only one at a time, and hold them so with both hands until they are wet through. Bubbles begin to rise continuously in their center, and when these bubbles cease they are wet enough.

(2) Squeeze the bandage until one-half the water oozes out, then hand it to the surgeon so that he may take the bulk of the roll in his right hand and the free end in his left. The distance from the nurse's basin to the surgeon's hand should be the shortest possible.

(3) Just as soon as the nurse relinquishes one bandage, she removes the wrapper and steeps a second, that time corresponding to the length of time required by an expert orthopedic surgeon to apply one.

(4) When all are on, she should, with both hands, scoop up the sediment left after pouring off the bulk of the water and pass it to the surgeon or keep it soft and equally mixed while he makes with it an extra coat quite smooth over all.

(5) At times it is necessary to bolster the cast by first applying a plaster splint which is best made on the operating-table. Therefore a space must be cleared by flexing the patient's other knee, or on the work-table used by the nurse, a glass or rubber surface being preferable. The measure is taken on the limb, then a wetted bandage is laid flatly on the table and folded on itself longitudinally. If this were a 5-inch bandage it would make five thicknesses 1 yard long and 5 inches wide, which would probably be thick enough. These splints are al-

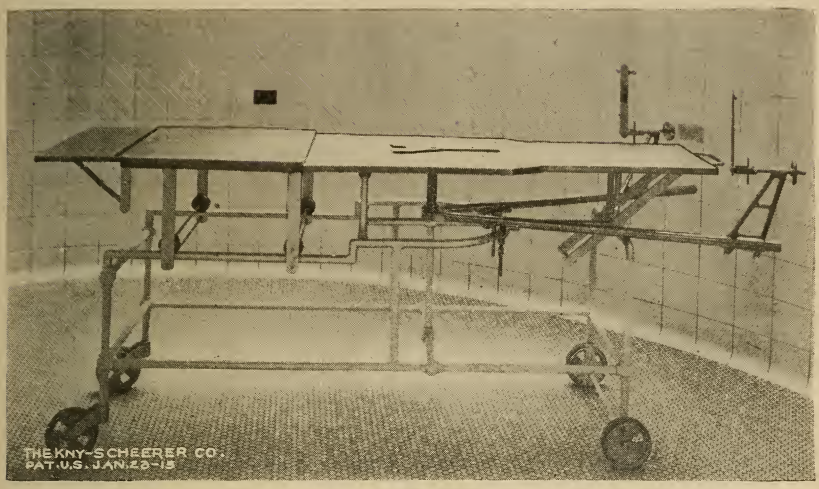


Fig. 50.—Fracture and orthopedic table in position for treating fracture of the lower extremity—adaptable to röntgenographic examination.

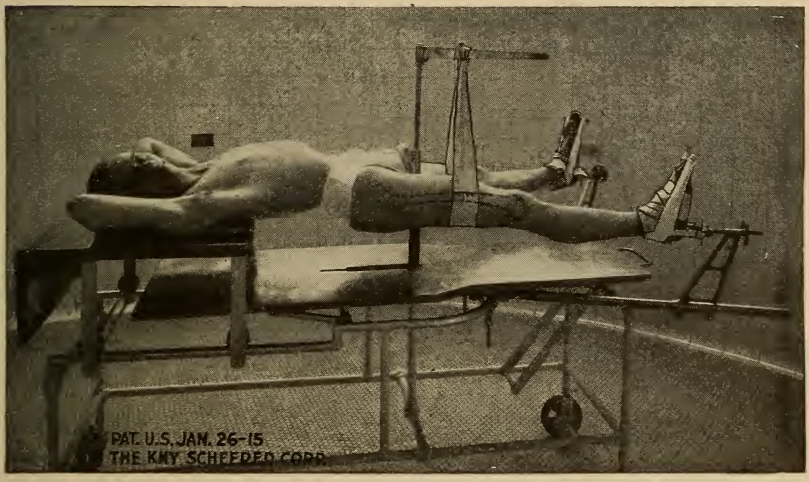


Fig. 51.—Fracture and orthopedic table, illustrating control of the leg in bone-plating for fractures.

ways made the single width of the bandage provided. Their length depends on the bone being set.

(6) When a cast has been put on, the old cast is broken up into small fragments to fit the trash-cans easily, and to avoid scaring some one who comes across a ghostly "limb" in the dark basements.

Most important of all, *the plaster must not be poured into the sink or hopper*, since it sets and stops up the plumbing. The basins should be scooped out into papers, thickly wrapped about, and put into the trash-cans.

Orthopedic Tables.—It is most unusual to find a standard orthopedic table outside the special hospital, but it is an excellent though very expensive article, consisting of a series of contrivances for procuring leverage, elevation, gaps to pass bandages, extension, etc. (Figs. 50, 51).

Adhesive Plaster Strapping for Flat-foot.—Adhesive plaster, 15 inches long and 3 inches wide, beginning at the outer side of the ankle, just below the external malleolus. Adduction of the foot (drawing it up inwardly to form an artificial arch). Passing the plaster tightly under the sole, up the inner side of the arch and leg. Two small strips of plaster, 1 inch wide, crossing it at the top, to keep it in place, but not completely encircling the leg lest they cut off the circulation. Measure with a tape before cutting. Then cut a series of six strips of adhesive, 15 inches long and $\frac{3}{8}$ inch wide, and cover this same area again, laying the back edge of each over the front edge of the one preceding, and catching them alternately in a braided or basket pattern, coming down from the top, with small strips running horizontally, working down to the malleoli, but leaving an open path down the instep, $1\frac{1}{2}$ inches wide, which may be bordered with two strips of the proper length to cover the raw edges. Over all apply a firm bandage. This should be removed once a week with ether or benzine, the foot examined and cleansed, then dressed again.

Other orthopedic work than what has been mentioned would not be undertaken outside a special hospital.

Orthopedic literature can be had in great quantities, its appliances are numerous, and long practical experience is absolutely necessary for a nurse to handle the little sufferers without inflicting needless pain. Below is given a list of terms that may be used in conversations regarding orthopedic cases which are too difficult for the general hospital to handle, but about which a nurse has a reasonable curiosity. Orthopedic cases are very long, and a nurse undertaking the care of one without previous training should at once betake herself to some institution to get the "first principles," since her patient is not an "emergency." Few women are blessed with a talent for mechanics, mathematics, or physics, and in orthopedic nursing all the skill depends on a knowledge of leverage, weights, pressure, and extension, added to patience, sympathy, and gentleness of touch. Then, again, the special hospital has a staff of skilled blacksmiths, carpenters, harness-makers, and shoemakers who work in conjunction to make a fitted support, consisting of a shoe and a brace for the leg, a jacket for the body, or a piece of apparatus with collar and pulleys for self-suspension, on patterns taken by the surgeons.

SOME SPECIAL APPARATUS

Jury Mast.—A frame of tempered steel, leather straps, and canvas to straighten and lengthen a curved spine, including as points of support the brow and chin and a point in the plaster jacket well below the deformity. Each must be accurately fitted to the individual and altered to suit his development. The hump must be well padded. Even with the most careful intentions frightful pressure-sores are caused by inexpert handling.

Fracture-box.—A support for the leg when the tibia or fibula is broken (Fig. 52).

Sayre's Suspension Apparatus.—A tripod, joined flexibly at the top and securely fastened when in operation by spikes into the floor. From the center at the top on a

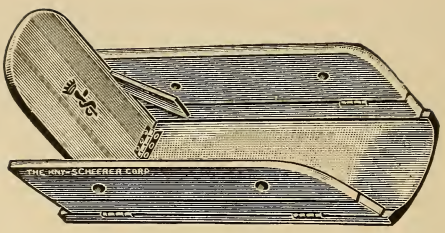


Fig. 52.—Fracture-box.

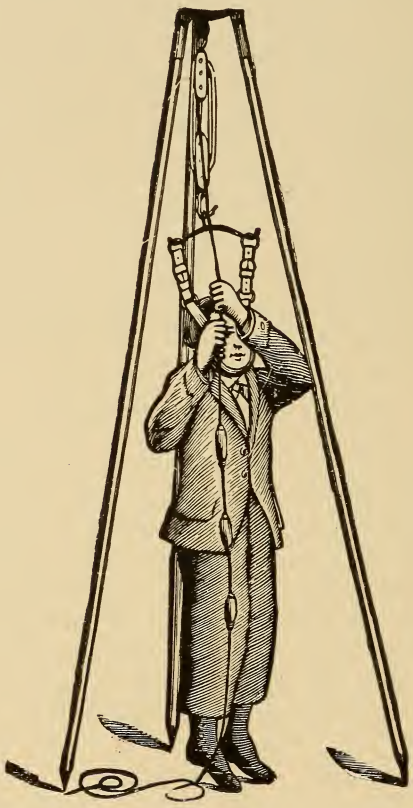


Fig. 53.—Sayre's suspension apparatus for application of plaster jacket, or exercises.

pulley runs a halter, adjustable to a collar, that thus supports the patient by the neck and chin. It is fitted to him, and he is then slowly raised until his toes are just off the floor. Then over only a knitted undershirt, with the proper pads and "scratcher," a plaster jacket is applied (Fig. 53).

Modified Buck's Extension for Hip Disease.—There is no splint as for fracture, merely the weights. The patient is secured around the waist by a folded towel from which a bandage runs up to the head of the bed. With large children a perineal strap may be used. In any case, the foot of the bed may be elevated.

NOTES

The most modern bone operation is that of *transplantation*. For Pott's disease, ununited fracture, etc., a very small piece is excised from the tibia and dovetailed into a crevice hewn out of the affected area. The hole in the tibia is replaced by healthy granulating bone tissue, *not* callus. Callus occurs in fractures. Small pins of tibia bone are inserted in holes drilled in the graft to maintain it *in situ*, just as a clever carpenter secures the pieces of a chair with wooden pegs.

CHAPTER XX

IMPROVISED OPERATING ROOM IN A HUMBLE HOME

HINTS

(1) COLD sterile water, boiled in CLEAN kettles the *night* before for a *morning* operation. Have enough kettles.

(2) Hot sterile water, boiled similarly a short time before the surgeon's arrival.

(3) Clean towels, old pieces of muslin of the size of a towel, put up in packages the day before, and sterilized as follows: Tie a cloth from handle to handle of a clothes-boiler to make a flat hammock above 2 gallons of water, and on that lay the packages. Lay the lid in position, and to its handle tie a heavy smoothing-iron to hold it down ("steam under pressure" or confined). Turn on the gas and *boil* for one hour. Remove the iron gently, then the lid *very* gently, so as not to permit the drops to fall on the packages. Lay them in a clean dry place to become perfectly dry, or dry them in the oven.

(4) Laparotomy sheet, table covers, etc., may be made out of sheets, pillowslips, etc. Do not destroy a good sheet for a laparotomy. Rather pin in position four pillowslips, fold, and sterilize.

(5) The surgeon brings his own supplies—cap, gown, mask, gloves, instruments, catgut, etc.

(6) Nowadays there is no reason why he could not bring his own dressings, but if he could not the nurse would make and sterilize a sufficient amount the day before.

(7) Saline made within the same day it is used requires only one sterilization. Two 1-quart bottles are sufficient. The saline is made and boiled, if possible, the day before,

filtered, and poured into two boiled bottles, which are then plugged with gauze and cotton and sterilized with the dressings. By being made triple strength and diluted twice with cold water, they can be cooled for use if sterilized again the day of the operation (set in a container of water and brought to a boil, then kept at boiling-point one hour).

(8) Vaselin, as a sterile lubricant, is set in its container (lid separate) in cold water, not quite to the edge, then brought to a boil and kept boiling for one hour. After cooling *in the container* (burned fingers being *res non gratæ* at this time) it is aseptically lidded and set aside. A small amount is taken out on a *sterile* grooved director when needed.

(9) Basins for the hands during the case will be found, from the gray enamel to the white stone china, in an old-fashioned bedroom. If enamel or china, they are disinfected by standing in bichlorid of mercury solution 1 : 1000 (preceded by vigorous scrubbing and rinsing).

(10) For an irrigator (seldom used) a boiled douche-bag or can, covered with a towel and hung on a weighted hat-tree with smoothing-iron or brick tied to the feet so that it will not topple, may be used.

(11) For a sponge and instrument table an ironing-board passed through the first and third panels of a clothes-horse, and all covered with sterile sheets, makes a safe place, easily set up and put away.

(12) For operating-table, an extension table is good, fully extended and the middle leaves taken out and laid longitudinally, well padded for the patient's comfort. The width at both ends makes little tables for the operator and anesthetist. The surgeon and his assistant stand in the "waist." Or two small tables, tightly and solidly fastened together, padded with blankets, sheets, etc.

(13) For improvised Trendelenburg, which is not likely to be attempted in house operations, one can slip a chair, face down and well-padded, on the foot of the table, or an assistant standing between the patient's

thighs raises her legs over his shoulders, standing with his back to her, or one may elevate the foot of the table with blocks, boxes, or solid chairs, propping the other end to keep it from sliding.

(14) The anesthesia set requires a pus basin, made from a large soap dish or a soup plate, and a cone for ether for the closed method (Fig. 54) made out of a towel and a folded newspaper; or for the open method or drop

Fig. 54.—Closed method of anesthesia.

method (Fig. 55) of either ether or chloroform a piece of flannelette over a tea or coffee strainer. Most anesthetists would bring their gas-ether or gas-oxygen outfit with them. The nurse may use her own hypodermic syringe for stimulation.

(15) The operation is rendered too dangerous if performed by gaslight or lamplight under ether, which is inflammable and volatilizes in a long, continuous invisible train that connects by-and-by with the flame.

(16) Daylight may be rendered equally diffuse by smearing Bon Ami on the lower half of the windows and at the same time obscuring them to the gaze of the passers-by.

(17) Oilcloth and thick pads of old newspapers confined in thin old sheets or gauze will protect the furniture, table, blankets, etc., from blood, water, and iodin.

(18) A stretcher is made by laying two square chairs face down on the floor, their feet meeting. The legs are

Fig. 55.—Open method of anesthesia.

very solidly spliced and a piece of board laid and fastened in the center, then the whole covered with blankets and draw-sheet. The upper ends of the chair or the top cross-piece make a secure handle. This stretcher stands at a good height by the bed for lifting the patient on or off with the aid of a folded sheet (Fig. 56).

(19) If vaginal work is to be done a Kelly pad (Fig. 57) is improvised as follows: Required, a blanket, old and soft; adhesive strips, 6 by 2 inches; a rubber sheet or a piece

of oilcloth, 2 yards by 1 yard; two hemostats; eight pieces of gauze bandage each 12 inches long. . Roll the blanket

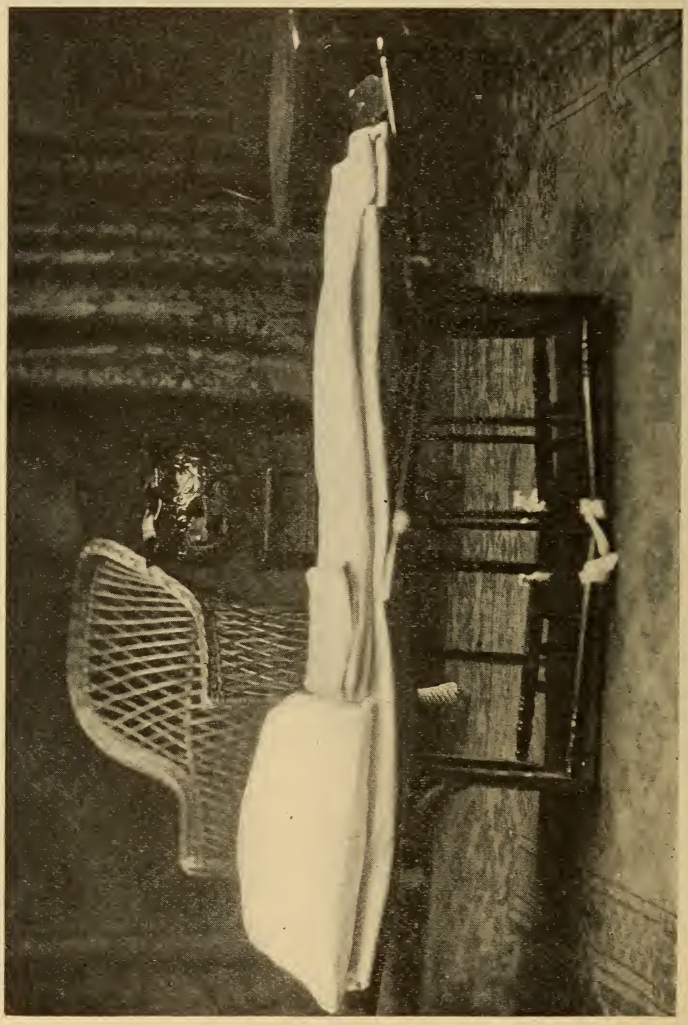


Fig. 56.—Improvised stretcher.

tightly and tie it in one long cylindric roll. Lay it on the farther long edge of the rubber and roll toward the

nurse, about two turns. Divide into three equal parts, the middle part at least being 2 feet wide. Grasping the roll firmly, turn at the first third at a right angle. Do the same with the last third. This leaves a triangle outside each side of the "Kelly pad." Reduce these triangles

Fig. 57.—Improvised Kelly pad.

by folding to one-half their size, bring over the roll, interiorly, and fasten with adhesive, artery clamps, or, at the worst, safety-pins, in the oilcloth only, not through an expensive rubber. Let the apron hang over into the waste pail. The whole resembles a soldier's blanket on the march.

(20) For a bed operation always use an ironing-board or the leaf of an extension table on the bed-frame under the springs at the patient's hips.

(21) If a nurse is far from her base of supplies, and has to improvise a gown in a hurry, it may easily be done as follows: Take one large sheet and fold the long edge over about 12 inches. Mark the center of this fold to go over the breast. Make plaits facing to the center all along this fold, reducing the gown in size to fit the shoulders with large safety-pins or bastings. Pin or stitch to the back of the neck two tapes each 12 inches long. Fold the whole in the uniform method, put up, and sterilize. On opening it, it is placed by the now scrubbed nurse, before her, so that the tapes are in position to be tied by any unscrubbed assistant, who then takes the very tip of the *corner* of the sheet, extended along her arm, and, as *she* pivots about, with her arm out as a lever, winds the fold around her arm so that it envelops it completely and is pinned to her back. A reverse swing puts the other corner in the same position.

(22) Improvised masks are made as follows: A piece of gauze $\frac{1}{2}$ yard square is, before the person scrubs, laid up on his chin. The lower two points are twirled and tied up on top of his head. The upper two corners are twirled and tied over and behind the ears.

(23) A piece of gauze 1 yard square brought (doubled diagonally) from the back of the neck, barely escaping the tips of the ears and tied on the brow, with the central point tied in with it, makes a cool, serviceable cap.

(24) A loose pyjama coat with a skirt made of a draw-sheet and put on backward makes a practical gown.

(25) The cleansing operations preceding the surgeon's arrival take place the day before—taking down pictures and hangings, washing the walls with bichlorid after dust has settled, covering the carpet with thick papers or old sheets, or both, screening the window with cheese-cloth for ventilation, and, if there is not time to dismantle, hanging sheets over everything high and dusty. One

great secret of modern surgical success is that everyone hastens so fast that there is no time for dust to fall into a wound nowadays.

With modern facilities of travel and the increasing erection of hospitals, these conditions would likely exist only in the remote wilds or in a case of virulent contagion with complications. But every nurse should cultivate the power of improvisation, so as to save expense of every kind and in every place where the illness is even the slightest financial burden.

CHAPTER XXI

A PLEA TO THE SUPERINTENDENT IN BEHALF OF THE OPERATING ROOM

AXIOMS

I. Consider that skill is worth more than money, and try to keep a capable official as supervisor of the operating room by giving her support in her just ambitions for her sphere of work.

II. Keep the Board of Governors interested in the special need of the operating room, whether it be of an electric cautery, a new table with convenient adjustments, or larger sterilizers.

III. Induce the auxiliary societies (in small institutions) to come and learn to fold gauze, so as to help build up large reserves of operating-room goods.

IV. *Take the side of the workers* in your own official family, and by learning what they need, and thinking and willing constantly, hypnotize the managers to buy it.

V. Only sell sterile goods by the consent of the supervisor, who knows her limitations—(*a*) vacations; (*b*) breakdown of apparatus; (*c*) sick nurses, etc. Issue a report to the Medical Board monthly, showing all the sales of such goods.

VI. When sterilizing goods for outside patients who intend to be operated on or confined at home, the price should be in proportion to the value which the supervisor bears to the institution, the time taken in the process, and the cost of the hospital equipment, all of which is special or technical; *e. g.*, $3.00 is a fair price for sterilizing a suitcase of goods for an obstetric case when the patient can afford to have the services of the type of physician who demands those dressings. Where pa-

tients are very poor they may be treated on the hospital wards, for part of which the municipality pays.

VII. Encourage the formation of an operating-room library, with special works of reference on gross and minute anatomy, surgery, materia medica, vaccine and serum therapy, pathology, bacteriology, etc., including cinematograph, charts, skeleton, mannikin, and other objects for demonstrating purposes. In surgery, the text-books should vary according to the variety of work undertaken—orthopedics, eye, ear, nose and throat, general, gynecologic, etc. Very frequently a patient going home, pleased with his treatment and particularly interested in the spotless operating room, asks what he could give, and, instead of saying "money," ask for some books to better that service.

VIII. When things are required for the operating room for some specific purpose get them immediately. Send an orderly as a special messenger. If these articles required could have been asked for previously, and were not, by some one's neglect, visit your wrath on the guilty one, but get them immediately none the less, so that the *patient will not suffer*. It would be wholesome to have the offender pay the messenger's carfare or the long-distance telephone expenses.

IX. Give the supervisor and pupils time off to visit other hospitals where surgery is particularly well carried on, and make arrangements ahead to have them met and taken around to see the salient points for their education. This is to be counted to them as work and their expenses should be paid, but a detailed report of what they saw demanded of them.

X. Consult the committee on surgical work, a part of the Medical Board, as to means of progress, and use all your energies to induce them to simplify technic and cut out unnecessary fads and fancies.

XI. Become a member of the American Hospital Association and attend its meetings. Take an active part in the operating-room work discussions and learn from

others, also giving the benefit of your own experiences. Push the work of standardizing all operating-room technic.

XII. In small village hospitals make a direct appeal for special articles to the people through the daily papers and the posting of lists in the hospital office, showing what articles are needed in the operating room.

XIII. When the office is notified that such and such a case is coming in, notify the operating-room supervisor *at once*, so that, in the event of *immediate operation*, she has all her forces at her disposal; the most needed nurses will not have just "gone off for their time" or some big cleaning task be just begun. *Never defer* giving the operating room any information. The Duke of Wellington said of the humid atmosphere of Scotland, "On a fair day, carry your umbrella; on a wet day, suit yourself," but often when we carry an umbrella on a damp day we do not need it, and often when in a state of semireadiness the dreaded event does not occur.

XIV. Being a very small staff, the concentration of any rush of surgical work is more than doubly felt by the operating room, through not only the number of cases, but their dressings and sterilizing. To the superintendent, who is also directress of nurses, it must be urgently remarked that by adding to the operating-room staff in a rush at the expense of other wards much is really gained. It does not pay to confront any human being with an impossible task, and where a very robust young woman may stand ward work excellently, she may suffer unheard-of fatigue in the operating room due to (1) tiled floors, (2) steam-heated and steam-moistened air, (3) very long hours, and (4) stairs, in some hospitals, to supply rooms. Good, efficient service cannot be obtained from fatigued bodies and minds, but the higher the standard of our care of nurses, the more exacting should be our discipline.

XV. Encourage the formation of an extensive reserve of goods. In a rather slack time, between seasons, or in a period of very good municipal health, every spare

moment should be utilized in making dressings, dressing covers, vaginal sets, etc., and the superintendent who would refuse to buy gauze or unbleached muslin for this purpose does not know her business. The poor patients are maintained by charity, and both those who can give charitable funds, and those who pay their own expenses have made their money by forethought and providence, and certainly, if they only knew, would make mock of any institution working on a narrow margin. These institutions are not commercial, not to be regarded as in any possible way self-supporting. It is the duty of the municipality to provide for its sick in the most efficient way by obtaining skilled officials and excellent materials. The cost of 100 yards or more of gauze or muslin do not come out of any special person's pocket, and yet, while giving that $2 or $15 is a relief to the man who thus performs his charitable duty, it is vastly more so to the strained mind of the anxious nurse who wants to feel that she is safe, no matter what emergency arises. True economy in a hospital is based on (1) getting a good quality of goods, (2) following them up to prevent stealing, burning, destruction.

XVI. The laundry is responsible to the matron or housekeeper, who should be directly responsible to the superintendent of nurses. In a private home the laundress is not responsible to the man of the house. But either directly or indirectly though this may be, the laundry must pay special attention to all operating-room linens, and there should be a waiving of red tape to help the supervisor of the operating room get a special set of articles rushed through at any one time, or to have her stock collected and laundered oftener than the wards do. This requires rules and checking up. Operating-room stuff must be cleared out at all times in the laundry.

XVII. Many times the superintendent is *persona non grata* in the operating room because he seems frigid and unsympathetic with the nursing staff, or too much inclined to take charge of them and tell them what to do.

Again, sometimes a woman of loud voice or arrogant manner may seem to take charge of the whole operating room, surgeons included, creating a decidedly unpleasant atmosphere. It is occasionally possible that one whose duties are far from asepsis and vigilance in detail, unmindful of the little niceties of position in the operating room, inadvertently bumps up against sterile tables in a way that would bring down a sharp reminder if it were done by only a pupil. All persons entering an operating room are subject to the will of the surgeon, and are in the presence of life and death. No visit should be made, then, unless its purport bears directly on the immediate event, and no conversation should take place except for the benefit of the case during that vital period. If, peradventure, a visitor detects a nurse making an error, it should be corrected *through* the supervisor.

XVIII. Politics, relating to the influence of one surgeon more than another, must not enter into a superintendent's policy. This is mentioned here since the surgeons usually bring the best paying cases to the hospital, and the operating room fees are a source of revenue. A capable superintendent is one who lives by the Ten Commandments and the Golden Rule. The official who can be strictly impartial to all men, and yet provide them good satisfactory service is very valuable to the institution.

XIX. It is very obvious to doctors and nurses if a superintendent visits the operating room only to see certain favorite surgeons operate, or to see certain fashionable patients operated on. It causes discussion, mockery, and disrespect, and is based on partiality, an insidious foe to good administration.

XX. The appointment of orderlies for this service is in some hospitals the duty of the superintendent, and should be a matter of extreme care, since they should be men of intelligence and good habits. They live on rather close footing with the nurses for ten hours a day, and they also must assist the surgeons in genito-urinary operations. While engaged and paid by one official, they work for

another, and might run to both with complaints. On being engaged they should be impressed by the superintendent that they are entirely at the command of the operating-room supervisor as to duties, relief, hours, etc. There will be no trouble when they see perfect coöperation between the office and the operating room.

XXI. The superintendent should visit the operating room at regular intervals, as the rest of the house, to see what repairs or improvements can be made, but at an hour suitable to the supervisor. He should also have a schedule for visiting the cases, but so arranged as to treat all in fairness. By showing a technical knowledge on some salient point and no ignorance of common things he fortifies his own position in the house.

CHAPTER XXII

THE CHOICE AND APPOINTMENT OF AN OPERATING-ROOM SUPERVISOR

To have a superior type of woman in this position tells so strongly in the complete training of pupils that the boards cannot take too much care in their selection. Again, the services rendered the surgeons must be performed in such an impartial and efficient way to keep up the reputation of the institution that her character must be equalled by her ability. Possibly more than any other official she comes nearer to the superintendent of the institution, excepting always the chief executive of the nursing department, since her buying is technical, her department so fertile in revenue, and nursing in its commoner sense all but eliminated. Nevertheless, she is first, last, and always a nurse. Her diploma reads identically the same as any other nurse's. To avoid any possibility of disloyalty or friction she should work under the jurisdiction of the superintendent of nurses, to whose class or type she wholly belongs.

The most important features in the make up of a fine supervisor are summed up as follows:

(1) A good sound physique, and a rather practical, calm mind.

(2) Presence of mind, determination, system in working.

(3) Dignity toward the pupils and a little aloofness from them always.

(4) Good principles always lived up to, generosity of disposition, and a searching grasp of human nature.

(5) Sympathy with the sick, especially with those overtaken by sudden accident or pain, and willing service in emergencies.

(6) Excellent education, much reading, and good manners.

(7) Breadth of experience and wide observation, both of things professional and things mundane.

If any woman in the world but a nurse were asked to measure up to all that she would quail. But many points have been omitted, and yet if a nurse fails to gain approval on any one of these things we magnify her failure instead of trying to help her to remedy it.

However, in applying for a new position, the future supervisor presents the diploma of her training-school, her State license to wear "R. N." tacked on to her name, and, let it be here suggested, a genuine and sincere statement from her Alumnæ Association, drawn up by a committee from her own class, who know her better than anyone else. Think what an effect that would have on the present-day nurses! No hospital official should ever consider engaging supervisors who do not wear the R. N. It is the duty of each institution getting public moneys to assume its share of the responsibilities, created by its very existence, for the State Board, or Regents, who have systematized and caused to be accepted by the legislature an emblem of ability and character for all worthy applicants who have in their turn also carried out their own responsibilities to their school and to themselves. Therefore, if equally stringent means were taken to encourage nurses daily to earn their future commendation, it would remodel the whole internal working of the present training-school system. Furthermore, when a nurse voluntarily adopts a "specialty" like operating-room work, it is to be hoped, and not assumed but carefully determined, that (1) she is suited for it; (2) she will contribute to it some additions in invention or discovery; (3) she will not have first failed in other fields of nursing; (4) she will be a good model for pupils to study.

But an applicant cannot demonstrate this at one or many interviews. It must be down in black and white. It is, therefore, here suggested that the State Boards

form a standard to which all who style themselves operating-room supervisors must measure up, consisting of a test taken every three years, and embracing these features: (1) Previous records of *skill*, *executive ability*, *character;* (2) oral examination in newer materia medica, technic, etc.; (3) practical demonstrations in demonstrating to a pupil (*a*) aseptic technic; (*b*) making dressings; (*c*) making solutions, etc.

The examiners should be surgeons and nurses in the van of surgery and nurses' *practical* affairs, also including instructors in pedagogics for nurses. There is just as much pedagogy required in teaching a nurse as in teaching literature or geometry.

The applicant for any position should make a written request for an interview with the *superintendent of nurses*, enclosing copies, not the originals, of her degrees and letters of commendation. Meanwhile she will have made inquiries from every source at her command, personal and professional, about the town, the people, the industries, the means of transit, as well as the hospital with its house officials and staff of surgeons. For this purpose medical directories and State reports of hospitals and training-schools classified on cold, hard facts are available to every one.

When the superintendent of nurses has had a searching and satisfactory interview with the nurse supervisor, who presents now her true, original letters, she visits with her, by previous appointment, the office of the superintendent, who is entitled to be thoroughly posted as to the qualifications of such an important applicant. From his standpoint again a searching talk bearing on the business relations of the operating room to the institution should be held, probably placing before the nurse a few examples of "political" difficulties that arose in the past and asking her how she would meet them. It is not, however, for the superintendent to instruct, appoint, or command this nurse. That would be expressed by him to her only through the conferences he would later hold with the

superintendent of nurses. Of course, in a busy staff it would be impossible for the latter to be always present, but when addressing the supervisors anywhere the superintendent should, *by courtesy*, always imagine her to be there, and never say anything that he would not say if she were there. As men usually deal with men, he would not give orders to a fireman "over the head" of the engineer. The comparison may seem crude, but the principle of responsibility is the same. He is not a nurse, and there are no diplomas yet issued for superintendents—speed the day!—with all due respect to the many excellent superintendents who have graced their gubernatorial chair in metropolitan institutions with a patience, executive skill, and tact almost unbelievable.

Assuming that the two chief officials agree about this applicant, an appointment should be made that she could meet the committee on surgical business, a flexible and fairly chosen live body of men in the Medical Board. These men should question the nurse until they are themselves satisfied that she has a good record and knows her business; even if they have to take her to the operating room and make her demonstrate difficult work there.

When all these persons agree, and the nurse finds the place suitable as far as she knows, the appointment is ratified by the Board of Governors in a formal letter, since they are responsible for her salary and, at the close of an engagement that was very efficient on her part, for her record. Boards are continuous in existence, but a superintendent of nurses, in small hospitals, frequently changes her position, and *her office* need not be *bound* by any obligations created by a predecessor. Obligations must be in black and white and ratified by a responsible person or body, but in courtesy to one's own profession many are continued, that make for the well-being of some workers.

In some states, like Maryland, certain hospital officials are bonded, and then given great responsibilities with,

naturally, greater freedom. But where no hostages are given, no obligations should be incurred.

An operating-room supervisor should make up her mind as to what she wants, what she can have, and how to make the best of what is offered; finding this within her scope, she naturally accepts. She should get accurate, reliable information about the length of her vacations, with or without pay, the hours for work and recreation, her other duties, if any, in the institution outside her own sphere, her relief, her private quarters, and all points relating to the management of the operating room; for example, the authority of the Medical Board or its committees, the number of surgeons, the nature and average amount of cases, the number of pupils at one time, the methods of caring for night cases, etc.

Business registries, run for financial reasons alone, are not the best sources of information for either the hospitals or the nurses, since they thrive on the number of "deals" they close, and do not comprehend the ethics and technic of the profession. Yet there are some very excellent registries conducted on that basis.

School registries do not make enough effort to promote this business side of their profession, on the other hand. While emanating from the finest hospitals, where naturally one would expect to find good young executives "in the bud," they simply busy themselves with sending nurses out to private practice.

A model registry should be that conducted by nurses for nurses, for executive, educational, operating, district, school, and private positions. But these fail terribly at times through being entirely too ethical. Few people can write a really honest testimonial. The nurses who wish to do institutional work present insincere documents, which pass the censor, whether through indifference or a mistaken desire to be ethical. It is time to expose this false free masonry which has not put the nurses through any real test. It takes a very great deal of expense and time to *verify* testimonials, and that is what a

registry is paid to do. But it is often neglected, with the result that invalid, irritable, unskilled failures are foisted on busy, strenuous high-grade hospitals, to the disgust of all who try charitably, in spite of first impressions, to give them time "to make good."

Some hospitals make it an unvarying rule never to take on an official or employee who is at the time "out of a job." While this has its exceptions, it will be found, in the main, to work well.

There should be a period set in all business arrangements, as a "notice" for the termination of the contract, to avoid irregularities in paying salaries, and sudden upheavals of departure, a month being none too long to give a hospital a sufficient chance to find a good supervisor, while, if the nurse were at fault, it might take her much longer to find a *position*, and yet she could *immediately* do private nursing, which compensates.

One thing most of all to be avoided is "one-man" appointments and "one-official" pulls. It is not a healthy condition of affairs where a nurse obtains a position through the influence of any man with whom she will afterward be closely identified in the operating room. It creates a feeling of indebtedness that she wishes to pay off. She then becomes unjust to other surgeons, and partiality is an insidious and heinous crime, burrowing its filthy roots through the whole structure. It would be no harm for an orthopedic surgeon to recommend some clever nurse he knew to an eye and ear operating room where he did not work. Similarly with the house staff, if the officials cannot agree that one applicant is worthy, better sacrifice her than the serenity that should exist between the heads, unless the objector can be proved wrong by overweight of evidence. Neither is it healthy to have undue interest on behalf of any one member of the Board of Governors in any supervisor. A little creeping up of her salary now and again, or longer vacations with pay will create a jealousy among the others in which her life will naturally be unhappy. A

nurse should always be approved or condemned by her peers.

This may be happily solved some day by the American Hospital Association. In it is a way out of most of our difficulties. If the *position* of operating-room nurse be standardized in all its features, and if these nurses also meet specially in committee, to learn from one another, study exhibits, hear lectures from the greatest surgeons, and improve their minds, the hospitals engaging them will be sure of much of their hoped-for aim.

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A MODERN NURSE'S QUINTALOGUE

I. Want something.

II. Know what you want.

III. Determine to get it.

IV. Think the best way to get it.

V. Work to get it, and as fast as you're knocked down, get up again and go on.

—*Anonymous.*

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